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A MONOGRAPH

OF THE

MOLLUSCA FROM THE GREAT OOLITE,

CHIEFLY FROM

MINCHINHAMPTON

AND

THE COAST OF YORKSHIRE.

BY

J. MORRIS, F.G.S. AND JOHN LYCETT.

PART II.

BIVALVES.

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PART II.  
BIVALVES.

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UPON a general review of the Oolitic Lamellibranchiate Mollusks, it will be found that a very large proportion consists of shells whose hinges may be arranged under one or other of the following two groups, each of which has various generic modifications. The first consists of a lengthened hinge plate, having a parallel series of transverse or oblique teeth, as exemplified by *Arca*, with its sub-genera *Cucullæa*, *Nucula*, *Leda*, *Macrodon*, *Isoarca*, *Limopsis*. The second kind of hinge is altogether destitute of teeth, and comprises the several genera of fossil *Myadæ*, as *Pholadomya*, &c., *Mytilus* with *Modiola*, *Lithodomus*, *Pinna*, *Trichites*, and *Thracia*. Deducting these, together with the forms whose hinge possesses only a ligamentary fossa, as *Lima*, *Pecten*, *Hinnites*, *Plicatula*, and those in which the ligament is inserted in distinct pits, as *Gervillia*, *Perna*, &c., it will be found that shells with hinge teeth constitute only a minority, and that the great family of the *Veneridæ*, though numerous with respect to individuals and number of species, pertains only to few genera. Experience has led us to distrust many generic names which have been given to these fossils, as *Pullastra*, *Donax*, *Tellina*, *Amphidesma*, *Chama*, *Lutraria*, *Sanguinolaria*, *Mactra*, *Gastrochaena*, and *Spondylus*; *Panopea* is also a genus to which a very heterogeneous assemblage of testacea has been referred; *Plagiostoma* has by common consent fallen from the list of genera, the Oolitic species being now referred to *Lima*. Nor has it in any one instance been ascertained that any of the Oolitic bivalves have spoon-shaped processes corresponding to those of the recent *Mya* and *Lutraria*. The shelly beds of the Great Oolite appear to have been accumulated in a sea not sufficiently tranquil to become the habitat of the *Myadæ*; the entire family were gregarious, but in the shelly Oolite we rarely discover a single valve of *Arcomya*, *Ceromya*, or of *Homomya*, the other genera of *Myadæ* being absent altogether. The crypts of *Lithodomus* prove that genus to have existed in great profusion, although it is very rare that the shells are found in the perforations themselves, neither can they be

detected in the substance of the valves of *Trichites*, although few shells of that genus, or of the adult specimens of *Crassina*, can be found, which are not bored or even honey-combed by their perforations, a fact which should teach us that the numbers of fossil specimens do not afford in every instance a sure indication of their former actual numbers. The *Trigoniæ*, which hold so important a position in the Oolitic testacea, are represented in the shelly beds by a great profusion of individuals; nevertheless, these beds do not appear to have possessed conditions favorable to the development of the several species; three occur abundantly in their earliest stage of growth, but in proportion as they increase in size, their numbers diminish, so that adult specimens are comparatively rare. In the species referred to *Pteroperna* (a sub-genus of *Avicula*), will be found some interesting forms serving to connect *Avicula* and *Pterinea* with the *Polyodontæ*, the hinge being somewhat identical with that of *Macrodon*; it occupies a conspicuous position in the Oolitic system. Another new generic form which remains to be exemplified is *Tancredia*, (*Hettangia*, Terquem;) although of small dimensions, and destitute of ornament or remarkable figure, it is nevertheless the genus which, by the constantly recurring force of numbers, most strongly dwells upon the recollection of those who have with their own hands cleaved the shelly beds of the Great Oolite.

On the other hand, in the muddy deposits which are associated with the Great Oolite, the family of *Myadæ* were tolerably abundant, if we may judge from the numerous species of *Pholadomya*, *Panopæa*, and its allied genera, *Pleuromya*, *Arcomya*, *Homomya*, which are found in the beds of indurated marl, intercalated with or overlying some portions of the shelly Oolite, throughout an extensive area; whilst many of the shells, the *Pholadomya* especially, retain the normal position in which they appear to have lived.

## BIVALVIA, *Linn.*—LAMELLIBRANCHIATA, *Blainv.*

### OSTREA, *Linnaeus*, 1758.

*General Character.* Shell adherent, inequivalve, foliaceous, irregular; umbones separated, slightly diverging; ligament internal, placed in a deep grooved trigonal pit, beneath the umbones. Muscular impression nearly central.

OSTREA RUGOSA, *Goldf.* Tab. I, fig. 4.

OSTREA RUGOSA, *Goldf.* Petref., tab. 72, fig. 10.

*Testá ovatá, valvâ inferiore profundâ concentricè rugosá, margine inferiore plicato; superiore subconvexá, undulatâ-rugosá.*

Shell ovate; inferior valve deep, with concentric rugose plications, the lower margin plicated; the upper valve slightly convex, rugose, and undulated.

The typical form of this shell, which we have provisionally referred to *O. rugosa*, *Goldf.*, has a considerable resemblance to *O. acuminata*; but the attached surface is

usually much larger, and the entire form is more irregular; it may be regarded as forming a passage between the crescentric figure of that shell and the less oblique species, with radiately plicated surfaces and margins; it was eminently gregarious, and most abundant upon the flaggy beds or tile stones of the Forest Marble; in the shelly beds of the Great Oolite it is much less common, and the specimens are usually small.

*Localities.* The vicinity of Tetbury and Cirencester in the Forest Marble; Minchinhampton Common in the Great Oolite.

OSTREA ACUMINATA, Sow. Tab. I, fig. 1, 1a.

OSTREA ACUMINATA, Sow. Min. Conch., t. 135, f. 2 not 3, 1816.

— — Roemer. Verst. Oolith., ii, p. 25, t. 18, f. 16.

— — Bronn. Leth. Geog., p. 192.

*Testá ovato-elongatá, interdum subcrescenticá; valvá inferiore convexa, umbone obliquo, acuminato; valvá superiore subplaná, ovatá, tenui.*

Shell ovately elongated, frequently subcrescentric, with concentric plications; umbones oblique, acuminate; the smaller valve flattened, thin, ovate.

This little species exhibits a full share of the varieties of form proper to the genus; in the marls and subordinate beds of hard rag in the Fuller's-earth, the valves constitute a considerable portion of the entire deposit, and in the shelly beds of the Great Oolite it occurs in great profusion; in France and the Jura it occupies a similar position, and in equal prominence.

*Localities.* Bath, Minchinhampton, and numerous other localities throughout the course of the Fuller's-earth and Great Oolite.

OSTREA COSTATA, Sow. Tab. I, fig. 5, 5a.

OSTREA COSTATA, Sow. Min. Conch., t. 488, f. 3, 1825.

— — Goldf. Petref., t. 72, f. 8.

— — Bronn. Leth. Geog., p. 190, t. 18, f. 18, 1851.

— — Deshayes. Traité Element., t. 53, f. 10—12, 1850.

KNORRII, (Foltz.) Zieten Wurtt., lx, t. 45, f. 2.

*Testá parvulá, obliquá, ovali, valvá inferiore profundá costatá; umbone affixo, costis dichotomis radiatá; superiore planá subradiatá.*

Shell small orbicular, or obliquely oval, the attached valve deep with numerous branched and somewhat rounded ribs, upper valve flat, margin undulated.

Mr. Sowerby remarks that the "branching, rounded ribs upon the under surface define this neat little oyster." It is one of the miniature productions of the Ancliff Limestone.

*Localities.* In the Cornbrash and Forest Marble of Wiltshire and Somerset; and in the Great Oolite of Ancliff, Wiltshire, and in Gloucestershire.

OSTREA GREGAREA, Sow., var. Tab. I, fig. 2, 2a.

OSTREA GREGAREA, Sow. Min. Con., t. 111, f. 1 and 3, 1815.

— — Goldf. Petref., t. 74, f. 2.

— — Bronn. Leth. Geog., p. 188, t. 18, f. 16, 1851.

— PALMETTA, Sow. Min. Con., t. 111, f. 2?

*Testá crassá, ellipticá, incurvatá costatá, valvá inferiore sub-carinatá, affixá, superiore convexo-planá, costis numerosis, rugosis, subacutis radiantibus vel distichis.*

Shell oblong, irregular, curved, costated, with unequal convex valves, the beaks slightly produced and incurved; costæ numerous, rugose, diverging.

The specimens figured, are referred to the *O. gregarea*, Sow., a social species which occurs abundantly in the Coralline Oolite of Westbrook, Wiltshire, and near Weymouth in Dorsetshire. The shells referred to this species in the Great Oolite are not generally in good condition, and vary in form and plaiting; some specimens presenting the characters of *O. solitaria*, Sow., others resembling the young state of *O. flabelloides*, Lamarek.

*Localities.* Minchinhampton, and in the Oolite of Lincolnshire; Stonesfield, Oxfordshire.

OSTREA SUBRUGULOSA. Tab. I, fig. 6, 6a.

? Var. of OSTREA ACUMINATA, Sow.

*Testá subtrigoná, incurvá, concentricè rugosá; valvá inferiore convexá, sulcis furcatis irregulariter radiantibus ornatá; valvá superiore sub-planá; apicè obliquo sub-acuto.*

A somewhat trigonal incurved shell, concentrically imbricated or rugose, and with irregular diverging small furrows on the convex valve; the umbone incurved and obtuse; smaller valve flat and nearly smooth.

A very common and characteristic species of the upper portions of the Great Oolite in Northamptonshire and Lincolnshire, where it occurs in sandy and clayey beds, which may probably represent the Forest Marble. It bears a general resemblance to the *O. acuminata*, Sow., of which it may prove to be only a variety from difference of habitat, but is distinguished by the more convex form and furrowed surface of the larger valve.

*Localities* In the Oolite of Kingsthorpe, Thrapston, Oundle, &c., Northamptonshire; and near Stamford, Lincolnshire.

OSTREA SOWERBYI. Tab. I, fig. 3, 3a.

OSTREA ACUMINATA, Sow. Min. Con., t. 135, f. 3 not 2.

*Testá depressá, elongatá, curvatá rugosá, concentricè lamellosá; valvá inferiore sub-convexá, superiore planá; umbone obtuso.*

A depressed elongated and slightly-curved shell, marked by concentric lamellæ at distant intervals. The umbones are nearly equal in size, broad, and obtuse. The larger valve is rather convex; the smaller valve flat, or sometimes a little concave.

This species is considered to be distinct from the *O. acuminata*, which is more regular, symmetrical, and incurved. It is very abundant in certain marly deposits belonging to the upper portion of the Great Oolite in Northamptonshire.

*Localities.* Sharnbrook and near Bedford; Blisworth, Kingsthorpe, Yardley and Aynhoe, Northamptonshire; Sapperton, Gloucestershire.

*Sub-Genus*—EXOXYRA.

Shell with the umbones involute.

EXOXYRA AURIFORMIS, *Goldfuss*. Tab. I, fig. 7.

EXOXYRA AURIFORMIS, *Goldfuss*. Petref., t. 86, f. 5

— — — *Buckman*. In Geol. of Cheltenham, p. 69.

? OSTREA OBSCURA. *Sow.* Min. Con., t. 488, f. 2?

*Testá ovato-suborbiculari depressá, valvá minore planá, inferiore subconica; umbonibus minutis involutis; laminis concentricis tenuissimis irregularibus.*

Shell ovately-orbicular, depressed, the smaller valve flattened, the larger subconical with a large adhering surface; umbones very small and involute; laminæ of growth concentrical, very delicate, and irregular.

This pretty species is sufficiently distinct from the contemporaneous species; it was collected by Professor J. Buckman, in a bed of yellow clay at Sevenhampton Common, and he has kindly placed it at our disposal.

*Locality.* Sevenhampton Common near Cheltenham.

PLACUNOPSIS. *Nov. Gen.*

*Testá suborbiculari, inæquivalvis, irregulari, tenui, non-auriculatá; valvá majore convexá, subobliquá, umbone depresso, submarginali; lineis radiantibus undulatis ornatá; margine cardinali brevi subrecto. Valvá minore planá integrá, interdum affixá. Cardo dentibus nullis, foveá parvâ transversâ internâ. Impressio musculari magno (biloba)? elliptica, subcentrali.*

Shell suborbicular, inequivalve, irregular, very thin, without ears; the larger valve convex, rather oblique, its umbo depressed and submarginal, the surface ornamented with undulated radiating lines; hinge-margin short, nearly straight. The smaller valve is flat, destitute of any foramen, and not unfrequently is affixed by its surface to other bodies. Hinge without teeth, with a small mesial transverse internal groove to contain the ligament. Muscular impression large (bilobed?), elliptical, subcentral.

This genus in its figure and character of the surface presents a considerable resemblance, both to *Anomia* and *Placuna*, but although possessing certain features of affinity to each of these forms, it is not the less separated from them by other characters of some importance. It is so irregular, that scarcely two specimens have exactly the same figure, so that the longer diameter may be either lateral or otherwise; notwithstanding this irregularity, however, it will be observed that the posterior or left side of the convex valve

is more produced, and has more convexity than the other; the substance of the test is papyraceous, and the surface of the convex valve often displays markings, which prove that for a considerable period these shells were attached to other bivalves by the surface of the flat valve, but that valve has never actually been observed attached, and it is very commonly preserved with the outer surface destitute of any traces of having been adherent. Judging therefore from the varying dimensions of the specimens, it does not appear that it adhered at any particular stage of its growth, but that it was only occasionally attached. From *Placuna* it is distinguished by the absence of internal diverging teeth; it is never auriculated, as in *Posidonia*, and the position of the hinge groove is very different; in *Posidonia* it forms a depression in the hinge plate, lengthened laterally, but in our genus it is transverse. The form occurs throughout the Oolitic rocks of England, exemplified by several species, which have usually been referred either to *Anomia* or to *Placuna*,—an erosion which not unfrequently occurs at the thinnest part of the valves where the muscular impression is situated, having apparently been mistaken for the foramen of an *Anomia*.

PLACUNOPSIS JURENSIS, Roem. Sp. Tab. I, fig. 8, Sa b.

PLACUNA JURENSIS, Roemer. Verst. Nord. Deutsch. Ool., p. 16, t. 16, f. 4.

ANOMIA JURENSIS, Morris. Cat. Brit. Fos., p. 105, 1843.

*Testá orbicularis, irregulari, papyraceá, sublamellosá; valvá convexá, umbone obtuso, depresso, submarginali; lincis radiantibus nodosis, laminis concentricis impressis. Valvá alterá planatá, umbone parvo depresso, lincis radiantibus undatis et tenuissimis.*

Shell orbicular, irregular, very delicate, somewhat lamellose; convex valve with the umbo, submarginal, obtuse, and depressed; radiating lines knotted, fine, numerous, waved and irregularly impressed with the concentric laminae. The other valve flattened or irregularly concave, its umbo small and depressed, the surface ornamented with numerous irregular radiating knotted lines.

In numerous instances this species attached itself by the flat valve to *Pectens*, *Lima*, and *Trigonia*, whose characteristic markings although scarcely, if ever, indicated on the interior of either valve, appear distinctly impressed upon the outer surface of the convex valve, almost obliterating the ornamented structure proper to the valve, so that the surface of the *Placunopsis* seems like a delicate tissue or veil spread over the *Trigonia* or *Pecten*. What renders this fact the more remarkable is, that the species of *Lima*, *Pecten*, and *Trigonia*, are very abundant, and are invariably found free from other attached shells. The valves of this delicate shell are abundant in the shelly beds of the Great Oolite, and occur likewise, though more rarely, in the Fuller's-earth and Inferior Oolite of Gloucestershire; but care is required to detach specimens, as it breaks with any trifling concussion.

*Localities.* Minchinhampton Common and Bisley Common in the Great Oolite.  
Leckhampton Hill and Nailsworth in the Inferior Oolite.

PLACUNOPSIS SOCIALIS. Tab. I, fig. 9, 9a.

*Testá parvá ovato-orbiculari, valvis valde inæqualibus et irregularibus, lineis radiantibus subtilissimis confertis; plicis concentricis paucis irregularibus.*

Shell small, ovately orbicular, with the valves very unequal and irregular; the umbones are marginal but very depressed, and scarcely distinguishable; the surface is covered with extremely fine densely arranged radiating lines, which are commonly visible under a magnifier upon the convex valve, and very rarely in the flat valve; the concentric plications are few, strongly marked and irregular.

This little shell is usually coloured with tints varying from lake to indigo and brown; it occurs throughout all the shelly beds of the Great Oolite in the Minchinhampton district; and towards the middle of the series in the soft shelly Oolite or oven stone, it is peculiarly abundant and gregarious, the largest specimens having a diameter of about 7 lines; although it does not exhibit any marks of having been attached or compressed, the figure of the valves is even more irregular than in *P. Jurensis*.

*Localities.* Minchinhampton and Bisley Commons.

PLACUNOPSIS ORNATUS. Tab. I, fig. 11, 11a.

*Testá parvá, ovato-orbiculari subpland, fragili, umbonibus sub-marginalibus depressis, costulis radiantibus numerosis equalibus et regularibus, aliisque interstitialibus tenuissimis, costulis spinis fistulosis, numerosis, depressis ornatis.*

Shell small, ovately orbicular, transverse, compressed, irregular, very thin; umbones sub-marginal, depressed, radiating costæ elevated, rounded, numerous, equal and regular, with interstitial and very fine striæ; the costæ are ornamented with numerous depressed fistulous spines.

The radiating costæ are elevated and undulated, and the numerous depressed fistulous spines which ornament them render it a pretty object under the magnifier; the character of the surface altogether is very similar to that of *Ostrea spondyloides*, (Schloth, Goldfuss, t. 72, fig. 5,) but that species pertains to the *Muschelkalk*. The other valve has not been recognised.

*Locality.* Minchinhampton Common.

PLACUNOPSIS RADIANS. Tab. I, fig. 10.

*Testá parvá sub-orbiculatá, umbone parvá, depresso, sub-marginali, lineá cardinis subrectá; costulis radiantibus rotundis distantibus et fistulosis, interstitialibus lævigatis; plicis concentricis distantibus.*

Shell small, sub-orbicular; umbo small, depressed, sub-marginal, hinge line nearly straight; radiating costæ rounded, elevated, rather irregular, distant, with fistulous plications upon their surfaces; the interstitial spaces are smooth; the concentric plications are few and distant; the general convexity of the shell is moderate, but the convex valve is unknown: not unfrequently near to the border a second series of costæ commence, but

which have no particular reference to the size of the shell. The large distant radiating costæ will distinguish this from *P. ornatus*, to which it is nearly allied.

*Locality.* Minchinhampton Common, where it occurs rarely in the soft shelly Oolite beneath the planking.

PECTEN, *Lamarck*.

PECTEN, *Rumphius, Chemn., Bolten, &c.*

JANIRA, *Schum, D'Orb.*

NEITHEA, *Drouet.*

*Gen. Char.* Shell regular, inequivalve, inequilateral, eared, hinge margin straight, surface with radiating ribs, lines or other elevations: hinge destitute of teeth, but having a central triangular pit containing the cartilage, muscular impressions one in each valve, large, sub-central.

PECTEN VAGANS, *Sow.* Tab. I, fig. 12, 12a.

PECTEN VAGANS, *Sow.* Min. Con., t. 543, figs. 3, 4, 5, 1826.

— SULCATUS, *Young and Bird.* Geol. Yorks. 333, t. 9, f. 9.

*Testá ovatá sub-compressá, sub-æquivalvi, lamellis imbricatá, costis raris regularibus (10—11), valvæ sinistræ angustis, squamis squamosis magnis, regularibus; dextræ costis latis confertim lamello-imbricatis; auriculis magnis inæqualibus lineatis.*

Shell ovate, rather flattened, nearly equivalve, with imbricated lamellæ; costæ few, regular (10—11), and narrow, with regular elevated squamous folds in the left valve; the right valve undulated with wide depressed costæ crossed by densely arranged imbricated lamellæ; auricles large, unequal, lineated.

This shell, although so very abundant and well known, has nevertheless been confounded with another very distinct species by Goldfuss, tab. 90, fig. 8, where an elongated and convex shell, with few squamous costæ, has unfortunately received this appellation; this latter shell, which is from the Lias of Bavaria, has only a remote resemblance to *Pecten vagans*. The costæ of the left valve are regular, symmetrical, and have the elevated plicæ upon their surface regularly and rather closely arranged, the interstitial spaces are narrow and slightly impressed with the plications; the surface of the other valve is nearly destitute of costæ, and exhibits them faintly only and near to the border. It is rare in the Upper Ragstones of the Inferior Oolite, but very abundant throughout the Fuller's-earth and Great Oolite, and is usually accompanied by *Ostrea acuminata* and *Avicula echinata*. It occurs also in the Cornbrash near Chippenham, Wiltshire.

PECTEN WOODWARDII. Tab. I, fig. 20.

*Testá æquivalvi suborbiculari, convexá, auriculis magnis inæqualibus, tenuissimé striatis; costis magnis radiantibus rotundis arcuatim divergentibus (circa 40 in ambitu), interstiiis angustis conformibus.*

Shell equivalve, suborbicular, convex; auricles large, unequal, and finely striated; costæ large rounded, radiately diverging (about 40 in the circumference), interstitial spaces narrow and conformable.

The anterior auricle is very large, the posterior one small; the costæ are regular, rounded, and closely arranged, the convexity of the valves is so considerable that the diameter through both is nearly equal to the lateral diameter. The general aspect is sufficiently distinct from all the associated species; *Pecten arcuatus*, which has the costæ similarly disposed, has a figure much less convex and orbicular, and the interstitial spaces are punctated.

*Locality.* This species is not unfrequently found in the white stone of Bussage and Eastcombs, bordering upon Bisley Common, and we are not aware that it has been found at any other locality.

The name from Mr. S. P. Woodward, of the British Museum, to whom it is dedicated.

PECTEN PEREGRINUS. Tab. I, fig. 14.

? Var. of PECTEN VAGANS, Sow.

*Testá inæquivalvi, ovato-orbiculari, auriculis magnis inæqualibus costellatis; valvâ sinistrâ subplanâ, costis radiantibus angustis, plicatis (circa 9), intervallis inæqualibus, nonnunquam costulis interstitialibus evanescentibus hinc et inde dispositis. Valvâ dextrâ convexâ lamellis tenuissimis concentricis imbricatis, et sulcis magnis radiantibus (circa 10).*

Shell inequivalve, ovately orbicular, auricles large, unequal and costellated; left valve rather flattened, radiating costæ (about 9) arranged at irregular distances, narrow, nearly equal, with small and irregular plications; there are likewise two or three small interstitial lines or elevations upon the anterior side of the valve. Right valve convex, with very fine concentric and imbricated lamellæ; radiating sulcations (about 10) large and rather irregular.

The irregular distances at which the four anterior costæ of the left valve are placed, their narrow figure and small plications, will serve to distinguish it from *Pecten vagans*, the great convexity and obliquity of the other valve will equally distinguish it from *Pecten fibrosus*. It occurs somewhat rarely in the shelly beds of the Great Oolite.

*Localities.* Minchinhampton and Bisley Commons.

PECTEN RETIFERUS. Tab. I, fig. 15, 15a.

*Testá ovato-orbiculari, convexo-planâ, auriculis magnis subæqualibus reticulatis; lineis radiantibus elatis numerosis, irregularibus, aliis concentricis et elatis paucioribus decussatis.*

Shell ovately orbicular, moderately convex, auricles large, nearly equal and reticulated; with radiating lines, elevated, numerous and somewhat irregular, crossed by others elevated and rounded but of unequal size and more distant.

The surface is crossbarred and somewhat rugose, the concentric lines in the more

advanced stage of growth being very prominent, unequal, rather irregular, and commonly covered with adherent shells; some slight undulations or irregularities are visible upon both descriptions of lines; young individuals are more depressed and ovate, their lines are very regular and distinct. It occurs not uncommonly in the planking beds throughout the Minchinhampton district, but the surfaces of the valves are frequently much obscured by adherent shells and adventitious matter entangled in the crossbarred surface. Height, 23 lines; lateral diameter, 21 lines.

*Localities.* Minchinhampton and Bisley Commons.

PECTEN HEMICOSTATUS. Tab. I, fig. 16.

? Var. of PECTEN VAGANS, Sow.

*Testá ovato-orbiculari inæquivalvi subæquilaterá, valvâ sinistrâ convexâ, lineis radiantibus irregularibus et lamellis concentricis crebris ornatâ; ætate adulto costis radiantibus magnis (5) distantibus plicis magnis instructis; intervallis latis, costulis minoribus interdum evanescentibus. Valvâ dextrâ depressâ, lamellis concentricis crebris, interdum interruptis, et sulcis radiantibus leviter impressis. Auriculis magnis inæqualibus, costellatis.*

Shell inequivalve, nearly equilateral, ovately orbicular, the left valve convex, with numerous irregular radiating lines crossed by closely arranged concentric lamellæ; the adult condition has the valve more convex, with five large elevated plicated and distantly arranged radiating costæ; the intervals are wide, each having a supplementary costa more or less distinctly marked. The right valve is much more flattened, with concentric densely arranged lamellæ, sometimes interrupted, and a few radiating sulcations, which are so faintly impressed, that they are only visible near to the lower border. Auricles large, unequal, and costellated.

The surface of the convex valve in progress of growth undergoes a striking change; in the young state it is beautifully reticulated, but has no indications of the costæ which afterwards distinguish it; the adult shells have a form more convex, with five prominent radiating costæ, of which those at the sides are the smaller; the costæ have a few large irregular plications; it is only shells of the largest size that have a supplementary costa in each of the interstitial spaces. The imbricated lamellæ of the right valve are more prominent than those of *Pecten vagans*, and the sulcations are much less strongly impressed, so that they can only be discovered by a close examination. It occurs not unfrequently in the shelly beds of the formation; but, from the general coarseness of the deposit, the more delicate features of the surface are rarely preserved. The right valve is delicate, and few specimens have been distinguished.

*Locality.* The Minchinhampton district of the Great Oolite, throughout the shelly beds.

**PECTEN PERSONATUS, Goldf.?** Tab. I, fig. 17.

? **PECTEN PERSONATUS, Goldfuss.** Petref., p. 75, t. 99, fig. 5.

*Testá inæquivalvi, æquilaterali, sub-orbiculari, convexo-planá, pellucidá, interné (12—14) costatá; valvá sinistrá costis externis minutis crebris lineis concentricis decussatis; dextrá lævi, auriculis inæqualibus obtusangulis costatis.* (Goldfuss.)

Shell inequivalve, equilateral, sub-orbicular, slightly convex, pellucid, its inner surface having costæ (12—14), left valve with very numerous external irregular radiating costæ, decussated by closely arranged concentric lines; the right valve smooth, its auricles unequal, obtusely angulated and costated.

It is only when the matrix consists of very fine sediment that the surface markings of this small and delicate shell can be distinguished; it is consequently rarely obtained. The specimens recorded by Goldfuss were found in the Inferior (*eisenschüssigen*) Oolite of Grafenburg and Besançon.

This species differs somewhat from the figure of Goldfuss, in having the longitudinal striation on the ears more prominent.

*Localities.* Minchinhampton and Bisley Commons in the Great Oolite; it occurs also in the Inferior Oolite of the same district.

**PECTEN ARCUATUS, Sow.** Tab. I, fig. 18.

**PECTEN ARCUATUS, Sow.** Min. Con., t. 205, f. 5—7, 1818.

— — ? **Goldfuss.** Petref., p. 50, t. 91, f. 6.

? Var. of **PECTEN LENS, Sow.**, fide *Bronn* and *Phillips*.

*Testá ovato-orbiculari, convexo-planá, æquivalvi, costellis radiantibus confertis, arcuatim divergentibus, hinc inde dichotomis, striis interstitialibus punctatis; auriculis inæqualibus costellatis.*

Shell ovately orbicular, slightly convex, equivalve, with radiating, depressed little ribs closely arranged, diverging with a curvature and sometimes dichotomous, the interstitial spaces punctuated; auricles unequal, ribbed.

The radiating ribs are moderately broad, but much depressed, and undulate rather irregularly where they are crossed by the few concentric folds of growth. This species occurs rarely in the shelly beds of the Great Oolite.

*Localities.* Bussage or Bisley Common; Stonesfield, Oxfordshire.

**PECTEN LENS, Sow.** Tab. II, fig. 1, 1a.

**PECTEN LENS, Sow.** Min. Con., t. 205, f. 2, 3, 1818.

— — **Goldfuss.** Petref., p. 49, t. 91, f. 3.

— — **Zieten.** Wurt., p. 69, t. 52, f. 6.

— — **D'Orb.** In Murch. Russia, &c., ii, p. 476, t. 42, f. 1, 2.

— — **Quenstedt.** Wurt., pp. 337, 538, 544.

— — **Bronn.** Leth. Geog., p. 206, t. 19, f. 7.

? **PECTEN ANNULATUS, Sow.** Min. Con., t. 542, f. 1.

— — **Goldfuss.** Petref., p. 49, t. 91, f. 2.

*Testá obliquá, ovato-orbiculari, plano-convexá, sub-æquivalvi, reticulatá, lineis confertis concentricis et radiantibus arcuatim divergentibus, hinc inde furcatis; auriculis inæqualibus reticulatis.*

Shell oblique, ovately orbicular, moderately convex, equivalve, radiating lines narrow, closely arranged, irregular, curving outwards, the interstitial spaces densely punctated or reticulated, occasionally bifurcated; concentric lines irregular; auricles unequal and reticulated.

There does not seem to be any sufficient or constant character which will enable us to separate this species from the *Pecten annulatus* of the Mineral Conchology and of Goldfuss; both have occasionally a certain degree of obliquity; the radiating lines of both are reticulated and bifurcated, becoming almost evanescent in the ultimate stage of growth; in the latter condition, the concentric elevated lines become constant, are much more prominent than the radiating lines, and do not furnish any peculiar or characteristic feature, we are therefore inclined to reunite the two species, and regard the annulated form to be merely a variety of the present one. Next to the *Pecten vagans*, this ranks as the most abundant *Pecten* of the Great Oolite, its vertical range is likewise remarkable, as it is found throughout the rocks of the entire Oolitic system; but attains its greatest development of size in the Coralline Oolite of Malton.

*Localities.* Wherever the Great Oolite is fossiliferous.

PECTEN ANNULATUS, Sow. Tab. I, fig. 13.

? Var. of PECTEN LENS.

PECTEN ANNULATUS, Sow. Min. Con., t. 542, f. 1, 1826.

— — Goldfuss. Petref., t. 91, f. 2.

— OBSCURUS, Sow. Min. Con., t. 205, f. 1.?

*Testá ovato-orbiculari, sub-æquivalvi, convexo-planá, striis radiantibus subtilissimis, inæqualibus arcuatim divergentibus, lineis aut lamellis concentricis distantibus interruptis; auriculis inæqualibus striatis.*

Shell ovately orbicular, nearly equivalve, rather depressed, radiating striations very fine, unequal, densely arranged, and diverging, the striations are broken and interrupted by prominent concentric lamellæ, which are rather distantly arranged; auricles unequal, striated.

The apical portion of the shell is destitute of the concentric lamellæ, which commence abruptly and continue to the lower border of the shell. It occurs commonly in the Cornbrash, Forest Marble, and in the upper portion of the Great Oolite; but is not found in the shelly beds of the Michinhampton district.

*Localities.* Near Cirencester, and at Sapperton Tunnel, Gloucestershire; in the upper beds of the Great Oolite, at Blisworth, Kingsthorpe, and other places in Northamptonshire and Lincolnshire; it occurs also in the Stonesfield Slate.

PECTEN CLATHRATUS, Roemer. Tab. I, fig. 19, 19a.

PECTEN CLATHRATUS, Roemer. Verst. Nordd. Oolith., t. 13, f. 9, 1836.

*Testá ovato-orbiculari sub-æquivalvi, tenui plano-convexá; auriculis magnis inæqualibus, valvâ sinistrâ convexiorâ; lineis radiantibus granulosis crebris inæqualibus et irregularibus, lineis concentricis obsoletis decussatis. Valvâ dextrâ lineis radiantibus remotioribus et irregularibus, lineis concentricis clathrato-nodosis.*

Shell ovately orbicular, subæquivalve, thin, rather flattened, auricles very large, unequal, and striated; left valve moderately convex, with radiating densely arranged granulated lines, irregular and unequal, crossed by very obscure closely arranged concentric lines, for the most part obsolete. Right valve more flattened, radiating lines more remote, but unequal and irregular, nodose where they are crossed by regular and distinct lines constituting a finely cancellated surface.

This very delicate and elegant species has the anterior auricles remarkably large; the right valve varies very considerably in the close arrangement of the radiating lines, and in their prominence; the concentric lines are very irregular, unequal, and uncertain in their prominence, so that many specimens which appear shining and smooth to the unassisted vision, disclose, under a magnifier, a very perfect and distinctly ornamented surface. Its entire aspect is sufficiently characteristic to render it easily distinguishable from contemporaneous species.

Height, 18 lines; lateral diameter, 16 lines.

*Localities.* Minchinhampton and Bisley Commons, in the shelly beds of the formation.

#### HINNITES, *De France*, 1831.

*Gen. Char.* Shell ovate, sometimes oblique, irregular, inequivalve; umbones depressed, approximate; auricles unequal, posterior auricle small, sometimes nearly obsolete, anterior auricle produced; left valve convex, right valve flattened, delicate, adherent. Hinge straight without teeth, with a mesial trigonal fossa, as in *Pecten*. The surface is ornamented with radiating, imbricated, or nodulated costæ.

There is usually some degree of obliquity in the valves; the convex valve is never adherent, the other constantly so, which together with its extreme delicacy will account for it having been so rarely discovered.

The shells of this genus have been described as *Spondylus* by Goldfuss, but they are really very distinct from that genus; the extreme delicacy and irregularity of the valves would lead us to the distinction, irrespective of the hinge characters which are equally distinct from those of *Spondylus*.

The finest examples of this genus are found in the Inferior Oolite, both in number, dimensions, and variety of ornament.

## HINNITES VELATUS, Goldf., Sp. Tab. II, fig. 2.

PECTEN VELATUS, Goldfuss. Petref., t. 90, f. 2.

— — Roemer. Verst., p. 67.

SPONDYLUS VELATUS, Goldfuss. Petref., t. 105, f. 4.

*Testá ovato-orbiculari convexá, auriculá anticá magná costellatá, posticá parvâ, sub-obsolete; costellis radiantibus (circa 30) nodulosis, subæqualibus, distantibus; interstitialibus lineatis; lineis nodulosis irregularibus. Valvâ dextrâ planatâ costellis lineisque ornatâ.*

Shell ovately orbicular, rather oblique, convex, anterior auricle large, posterior small, nearly obsolete, radiating little costæ (about 30 in the circumference) nodulated, nearly equal, and distantly arranged; the interstitial spaces have unequal and irregular nodulated lines, from one to three, being contained in each space. The right valve is flattened and ornamented in a manner similar to the other.

This species would appear to have a considerable range, both stratigraphically and geographically; it occurs in the shelly freestone beds of the Inferior Oolite, in the Fullers-earth, Great Oolite, Forest Marble, and Cornbrash.

*Localities.* Leckhampton Hill, the Sapperton Railway Tunnel, the entire Minchinhampton district of the Great Oolite, and in Northamptonshire and Lincolnshire.

## HINNITES TEGULATUS. Tab. II, fig. 3, 3a.

*Testá ovato-orbiculari convexâ; valvâ sinistrâ auriculâ anticâ magnâ; posticâ subnullâ; costellis radiantibus (32—34) tenuibus, regularibus transversé plicatis; plicis vel tegulis concentricis crebris subæqualibus interruptis.*

Shell ovately orbicular convex, the left valve with a large posterior auricle, anterior auricle obsolete; radiating little ribs (32 to 34 in the circumference,) fine, regular, and transversely plicated; plications concentric nearly equal, closely arranged but occasionally interrupted.

The radiating little ribs are delicate, regularly arranged, and impressed by the concentric plications, they are prominent about the middle of the valve, and become finer towards the sides; the right valve is unknown. The figure presents an approximation to that of *H. velatus*, but it appears to have more convexity and less obliquity; moreover the character of the surface, with its fine regular distinct radiating ribs, is very different from the irregularity observable in the other species. Height, 10 lines; lateral diameter, 8 lines.

*Locality.* Minchinhampton Common. Rare.

PLICATULA. Lamarck, 1801.

*Gen. Char.* Shell adherent, inequivalve, irregular, not eared, umbones terminal and pointed, no external area; ventral margin rounded, and more or less plicated. Hinge with two large diverging cardinal teeth in each valve, the teeth are striated laterally, and there is a conical fossa between them to receive the ligament, which is almost internal.

## PLICATULA TUBERCULOSA. Tab. II, fig. 4.

*Testá ovato-orbiculari subobliquá, convexo-planá tuberculis obtusis numerosis in lineis radiantibus feré dispositis; umbonibus lævigatis sine tuberculis.*

Shell very irregular, ovately orbicular, rather oblique, and depressed with numerous obtuse tubercles, for the most part disposed in radiating imperfect lines, umbonal extremity smooth, destitute of tubercles.

The round blunt warty tubercles have an aspect very different from the spines, either fistulous or pointed, with which the *Plicatulæ*, are for the most part furnished. The tubercles usually increase in size towards the ventral border of the valve, but in a very irregular manner, which, together with the very unequal and irregular surface of the valve, produces a very confused appearance; thus it happens that no two specimens can be found which nearly resemble each other; occasionally, the tubercles may be discovered approximating to the fistulous character; the margins of the valves are plicated in a very irregular manner. It is somewhat rare, but occurs in several of the shelly beds.

The two diameters across the valves are nearly equal, and rarely exceed 10 lines.

*Localities.* Minchinhampton and Bisley Commons.

## PLICATULA FISTULOSA. Tab. II, fig. 5.

*Testá ovato-orbiculari depressá, costulis fistulosis radiantibus irregularibus interstitialibus profundis.*

Shell ovately orbicular depressed, costæ radiating irregular, with numerous irregular prominent fistulous spines; interstitial spaces deep.

About 12 or 13 costæ are distributed around the circumference of the valve; owing to the delicacy of the test, it is very rarely that a perfect specimen can be obtained.

*Locality.* Minchinhampton Common.

AVICULA, *Lam.* 1801.

*Gen. Char.* Shell inequivalve, eared, base transverse, straight, its extremities produced and forming auricles, left valve convex, umbone prominent; right valve smaller, flattened, its umbone depressed, and nearly obsolete. Hinge linear with a small indistinct tooth in each valve beneath the umbones, and a lengthened marginal ligamentiferous area. One rounded subcentral muscular impression in each valve, with a series of smaller ones in a line near the umbones:

AVICULA COSTATA, *Sow.* Tab. II, fig. 6, 6a.

AVICULA COSTATA, *Sow.* Min. Con. t. 244, f. 1, 1819.

— — *Smith.* Strat. Syst., pp. 67, 81.

— — *Ib.* Strata Ident. Clay over the Upper Oolite, f. 8.

*Testá convexá oblique-ovatá, auriculis parvis subæqualibus, umbonibus prominulis, costis (circa 18), radiantibus equalibus rotundis, distantibus, interstitiis planis, latis et lævigatis.*

Shell convex obliquely ovate, auricles small, nearly equal, umbones prominent, costæ (about 18), radiating, equal, rounded and distant, the interstitial spaces flattened, wide and smooth.

This shell, so characteristic of the Bradford clay of Wiltshire, occurs very rarely in the shelly beds of the Great Oolite, and these are of very diminutive size.

*Locality.* Minchinhampton Common.

AVICULA ECHINATA, Sow. Tab. II, figs. 7, 7a.

AVICULA ECHINATA, Sow. Min. Con., t. 243, 1819.

— — Smith. Strat. Syst., p. 67.

— — Ib. Strata Ident., p. 26; Cornbrash Plate, f. 8.

? Var. AVICULA TEGULATA, Goldfuss. Petref., ii, p. 132, t. 121, f. 6.

*Testá ovato-obliquá, auriculis equalibus parvis, valvâ sinistrâ convexâ costulis radiantibus numerosis, aliis minoribus interstitialibus alternatis, et lineis transversis decussatis nodis formante. Valvâ alterâ subplanâ, lævigatâ, lineis radiantibus tenuissimis subobsoletis.*

Shell ovately oblique, auricles equal and small; left valve convex, with numerous radiating ribs, alternating with a smaller series in the interstitial spaces, and decussated by transverse, rather distant, regular lines, which form little knots as they pass over the costæ; the knots are more elevated, and closely arranged upon the anterior side of the shell. The other valve is nearly flat, smooth, with very fine distant and rather indistinct radiating lines.

This species is moderately common in the shelly beds of the Great Oolite, but the valves are always disunited, and its state of preservation very inferior to specimens obtained from the clay beds of the Fullers-earth, the Bradford Clay, or the Cornbrash, for its vertical range is very considerable.

*Localities.* Wherever the Great Oolite is shelly. Other geological positions are the Fullers-earth clays, of the Cotteswolds; likewise in the clays of the Cornbrash, the Forest marble, and the Bradford clay of Wiltshire; and also at Pavingham and other places in Bedfordshire.

#### *Sub-Genus*—PTEROPERNA.

*Testá subæquivalvi inæquilaterá, utraque latere alata, alá anticâ brevi, posticâ productâ, et marginatâ.*

*Margo cardinalis rectis, plus minusve obliquis, areâ ligamenti internâ, elongatâ, margini externi parallelâ.*

*Cardo dentibus infra umbonem numerosis angustis parallelis et minutis antrorsum vergentibus et costis posticis elongatis margine cardinali parallelis.*

*Umbones anteriores parvi depressi. Impressiones musculares duæ, in utraque valvis anticis parvis, posticis magnis ellipticis.*

*Facies externa sulco longitudinali elongato, sub-marginem cardinalem sitam.*

Shell nearly equivalve, inequilateral, both extremities winged, anterior wing short, posterior elongated, its extremity margined.

Hinge margin straight, more or less oblique, ligamental area internal, and nearly parallel with the external margin. Hinge with numerous very small parallel teeth placed beneath the umbones near to the anterior extremity of the shell, and one or two posterior or internal costæ, which are elongated and extend posteriorly nearly parallel with the hinge margin. Umbones anterior, small and depressed. Muscular impressions two in each valve, of which the anterior or byssal are very small; the posterior expanded, elliptical, and not strongly marked. External surface either ornamented or plain, having an elongated longitudinal groove extending posteriorly to the umbo, and parallel with the hinge margin in each valve.

This remarkable Oolitic form replaces and represents the genus *Pterinea* of the Palæozoic formations; its affinities to that genus are so evident, that it is necessary to inquire whether *Pteroperna* should be arranged as a sub-genus of *Pterinea* only, or is entitled to rank as a distinct genus. The principal distinguishing features are internal. In *Pterinea* the posterior elongated accessory ribs or teeth proceed obliquely downwards towards the inferior and posterior extremity of the valves, as far as the border of the large posterior muscular impression, at the anterior side of which they terminate abruptly; the muscular impression is angular, and extends upwards nearly to the hinge margin posteriorly. In *Pteroperna*, on the other hand, the posterior costæ extend along the inner surface of the hinge margin, almost parallel with it, and are consequently placed upon the hinge plate above the muscular impression, which is rounded or elliptical, and placed lower or more nearly to the middle of the posterior surface. As minor points of distinction it may be mentioned, that in *Pterinea* the anterior teeth vary in number from two to four only; but in our typical shell, *Pteroperna costatula*, they are not less than sixteen, and are so minute that they scarcely occupy a greater longitudinal space than those of *Pterinea*. Externally our genus possesses a characteristic feature very convenient for the Palæontologist, who is rarely able to refer to the hinge, and which readily serves to distinguish it both from *Pterinea* and *Avicula*; we allude to the elongated posterior groove, which is always visible upon the surface, and of which the other two forms are destitute. Regarding, therefore, the position of the internal ligamental groove and accessory costæ, together with the form and position of the posterior muscular impression as indicating a corresponding difference in the structure of the animal, when compared with those parts of *Pterinea*, we consider ourselves justified in considering the Oolitic form as a genus distinct from but nearly allied to *Pterinea*.

*Pteroperna* also presents considerable analogy to the recent genus, *Malleus*.

PTEROPERNA COSTATULA, *Deslongchamps*, sp. Tab. II, figs. 8, 8a, 13, 13a.

GERVILLIA COSTATULA, *Deslongchamps*. Mém. Soc. Linn. du Calvados, 1824; tom. i, t. v, figs. 3—5.

AVICULA POLYODON? *Burignier*. Mém. Soc. Philomath. Verdun, 1845, pl. iv, fig. 16.

*Testá obliquá, lineá cardinali recto, elongato, postico valde producto et emarginato, valvá sinistrá modico convexo, valvá dextrá subplaná, umbone depresso, latere postico in utraque valvá curvato aut excavato.*

*In ætate juniore, valvá sinistrá convexo-brevi, costulis radiantibus (6—8) elatis, acutis subundulatis, et inæqualibus cum lineis transversis interstitialibus regularibus et tenuissimis.*

*In ætate adulto, valvá sinistrá sine costulis aut striis cum laminis incrementi paucis, distantibus. Valvá dextrá semper lævigatá.*

Shell oblique, hinge line straight, elongated, very much produced posteriorly and emarginated, left valve moderately convex, right valve more flattened, the umbo depressed; posterior side in each valve curved, its margin concave.

This species occurs under the following conditions of growth:—

*In the young state*, the left valve is very convex and short, having radiating costæ (6—8) elevated, acute, slightly waved and unequal, the interstitial spaces with regular, transverse, fine, closely arranged lines.

*In the adult state*, the left valve is without costæ or striæ, having only a few distant lines of growth. Were instances wanting to exemplify the advantage which is derived from the inspection of a large number of specimens in every stage of growth, undoubtedly the present species might be selected for such a purpose, the two extremes of growth presenting an aspect so dissimilar, that until numerous examples of every intermediate grade had been obtained, we hesitated with respect to their specific distinctness or identity; minute specimens occur in great numbers, having a length of only three or four lines; in these the costæ are always very prominent, the number of costæ vary from 6 to 8, they occupy only the middle portion of the valve, the sides being plain. The costæ continue distinct, but less conspicuous, when the shell has attained a diameter of 16 or 18 lines, but the costæ have then become waved, irregular, and unequal; beyond these dimensions, the valve is either plain, or has only faint indications of costæ, crossed and interrupted by laminæ of growth; but even in the ultimate stage of growth, when the hinge line has attained the length of five inches or upwards, and the test has acquired a considerable degree of thickness, the left valve has never so smooth a surface as the other, the last faint indication of its having previously possessed a sculptured surface. The specimens figured by M. Deslongchamps and M. Buvignier have only a very remote resemblance to each other, and tend to illustrate the foregoing remarks; *Gervillia costatula* is stated by the former author to have only four or five costæ, but the smaller number is probably owing to the less perfect state of the specimen, or to accident; in the

young state, the shell is thin and delicate, more especially the right valve; the latter is consequently comparatively rare; and M. Deslongchamps had not recognised it in Normandy, when he published his description of *Gervillia costatula* in 1824; at that period so few species of *Gervillia* were known, that the *usual* character of the surface could not be considered as ascertained, nor likewise the limits to which any variation in the hinge was restricted; but now that a considerable number are recorded, it will be found that in few instances where the hinge of *Gervillia* has been disclosed has a sculptured surface been coincident with it: the hinge of *Gervillia costatula* given by M. Deslongchamps, differs somewhat from our own, and from the figure of M. Buvignier; but as it is still more unlike the hinge of *Gervillia*, we might from the hinge alone conclude that it had been incorrectly allocated. The shell figured by M. Buvignier, though very imperfect, is readily recognised as our own species in the ultimate stage of growth, and having a degree of obliquity greater than is usual. It occurs in all the shelly beds of the Minchinhampton district, but specimens of the ultimate stage of growth have only been obtained in the planking of Minchinhampton Common. The same species, or one nearly allied to it, has also been procured, rarely, in the free-stone beds of the Inferior Oolite in the same district.

*Localities.* Minchinhampton; Ranville near Caen, Normandy; St. Mihiel, France.

**PTEROPERNA PYGMEA**, *Dunker*, Sp. Tab. II, fig. 11, 11a.

**AVICULA PYGMEA**, *Koch and Dunker*. Norddeuts. Ool. Versteinerungen, t. 3, f. 6.

*Testá parvá, subæquivalvis, ovato-obliquá, concentricè idque obsoletè striatá; alá anticá rotundatá, sinuatá, posticá excavatá; umbonibus prominulis.*

Shell small, subæquivalve, ovately oblique, concentrically, but obsoletely striated; anterior wing rounded and produced, its lower border sinuated, posterior wing excavated by a longitudinal furrow; umbones rather large and prominent, rising higher than the hinge line.

The right valve has a somewhat flatter surface than the other, and exhibits very slight traces of one or two longitudinal costæ; the transverse lines are not usually preserved, and are visible only upon a portion of one of our specimens.

*Locality.* It occurs somewhat rarely in the soft Oolite which overlies the Weatherstone Beds at Minchinhampton Common.

**PTEROPERNA EMARGINATA**. Tab. II, fig. 10.

*Testá subplaná, ovato-elongatá et obliquá, valvá sinistrá lævigatá, striis concentricis subobsoletis; alá anticá parvá, posticá emarginatá. Valvá dextrá ignotá.*

Shell rather flattened, ovately elongated, and oblique; left valve smooth, with concentric and nearly obsolete striæ; anterior wing small and pointed, posterior emarginated. Right valve unknown.

The degree of obliquity and flatness is much greater than in the associated species, and the anterior wing is smaller; some traces of an elongated groove are visible upon the posterior wing of the left valve.

*Locality.* Minchinhampton Common, where it is very rare, and occurs in the bed of soft shelly Oolite which overlies the Weatherstones.

### GERVILLIA, *DeFrance*, 1820.

*Gen. Char.* Shell subæquivalve or inequivalve, inequilateral, elongated, transverse; hinge margin usually straight, lengthened, and oblique; umbones small, oblique, anterior, contiguous, rarely terminal; hinge linear, marginal, with many oblong parallel, but rather distant and irregular pits in each valve, placed transversely to the hinge line; internal hinge teeth parallel, oblique, placed anteriorly, or beneath the transverse sulci.

The increased number of species exhibit characters which render it necessary to arrange them under two sections.

*a'* Shell subæquivalve, margins of the valves regular.

*b'* Shell very inequivalve and irregular, more or less contorted; margins of the valves close fitting, but sinuated.

Section *a'* comprises the usual well-known subæquivalve species.

Section *b'* has for examples *G. monotis*, Deslong., *G. Hartmanni*, Goldf., and *G. tortuosa* the *Gastrochæna tortuosa* of Phillips.

### Section *a'*.

GERVILLIA ACUTA, *Sow.* Tab. III, fig. 12, 12*a*.

GERVILLIA ACUTA, *Sowerby.* Min. Conch., t. 510, fig. 5, 1826.

— LANCEOLATA, *Goldfuss.* Petref., t. 115, fig. 9.

? — ACUTA, *Phillips.* Geol. York., tab. 9, fig. 36, 1835.

? — SILIQUA, *Deslongchamps.* Mem. Soc. Linn. Calvados., t. 4, 1824.

*Testá lanceolatá in vertice convexá, margine cardinali perobliquo depresso, umbonibus angustis acutis foveolis (3) quadratis.* (Goldfuss.)

Shell lanceolate, slightly curved, subæquivalve, anterior side moderately convex, posterior side compressed and attenuated; hinge margin very oblique, with three quadrate hinge pits; umbones attenuated, anterior auricle acute and pointed, posterior auricle forming an obtuse angle with the border beneath it; folds of growth irregular, strongly marked. Compared with *Gervillia monotis*, the valves will be found less contorted or more nearly equivalve, the hinge border shorter, and the posterior auricle is not produced as in that species; in common with other species, the right valve is thinner, smoother, and more flattened than the other.

*Localities.* It occurs in the Stonesfield slate of the Cotteswolds (Buckman). In the slaty Oolite of Collyweston, Northamptonshire.

## GERVILLIA SUBCYLINDRICA. Tab. III, fig. 13, 13a, b.

? Var. of GERVILLIA ACUTA, Sow.

*Testá subæquivalvi, elongatá, subcylindricá, marginè cardinali majis obliquo; umbone in valvâ sinistrâ obliquo, prominulo, antico; valvæ dextræ umbone depresso, acuto. Cardo foveolis 3 aut 4, dentibus internis tribus obliquis, anticis.*

Shell subæquivalve, elongated, subcylindrical; hinge line very oblique, lengthened, and nearly straight; umbo in the left valve oblique, prominent, but not terminal; right valve with the umbo depressed and acute; hinge with three or four marginal pits, and three oblique, anterior, and internal hinge teeth.

Without care this shell may be confounded with *G. aviculodes*, Goldfuss, t. 115, f. 8, but upon comparison the latter shell will be found wider, and the umbones straighter, and more acute; the hinge line also is inclined at a smaller angle, the general figure being less elongated and cylindrical. From *G. siliqua*, Deslongchamps, the very different inclination of the hinge line and straighter form will distinguish it.

*Locality.* Minchinhampton Common, where it occurs somewhat rarely in the planking.

## GERVILLIA BATHONICA. Tab. II, fig. 15.

*Testá oblongá, planatá, subæquivalvi, umbonibus terminalibus acutis, margine cardinali recto, obliquo, (plerumque ad angulum 45 gradum inclinantibus,) latere antico recto interdum subexcavato, basi curvatú; foveolis (9) oblongis, æqualibus et regularibus; dentibus cardinis interné duobus, obliquis, anticis.*

Shell oblong, flattened, subæquivalve; umbones terminal and acute; hinge line straight, oblique, (for the most part inclined at an angle of 45 degrees,) anterior side straight, sometimes rather excavated, base rounded; hinge pits oblong (nine in number), equal and regular; internal hinge teeth two, anterior, and oblique.

The figure varies so considerably, that but for the inspection of a considerable number of examples of all stages of growth, they would probably be separated into at least two species, hardly two specimens, indeed, can be found exactly alike in the figure of the anterior margin, the angle at which the hinge is inclined, the degree of convexity in the valves, or in the general length of the figure.

The terminal position of the umbones together with the straight or even slightly concave figure of the anterior margin gives to it very much the figure of *Perna*, but the large oblique internal teeth in the hinge, and absence of the anterior hiatus or corrugation, effectually separates it from that genus.

Its habits were eminently gregarious, and in certain layers of the white stone at Bussage and Eastcombs, it occurs in great numbers to the exclusion of nearly every other species; but even in these circumstances, the valves are very rarely found in apposition,

and the usual length is about an inch; it occurs, however, in all the shelly beds of the Minchinhampton district.

In examining approximate species it will be found that the figure is less quadrate than *Perna quadrata*, Phillips; the terminal umbones separate it from *Gervillia acuta*, Goldfuss; and from *Perna mytiloides*, Goldfuss, the straightness of the hinge line is a point of distinction.

*Locality.* Minchinhampton.

GERVILLIA OVATA, Sow., Sp. Tab. II, fig. 12, 12a.

AVICULA OVATA, Sow. Min. Con., t. 512, f. 2, 1826.

*Testá ovato-obliquá, convexá et lævigatá, valvâ sinistrâ convexá, umbone obliquo, mediano, margine cardinali brevi, subrecto, margine antico rotundo; auriculis submellis, valvâ dextrâ plano-convexá, umbone parvo. Sulcis cardinis externé tribus, magnis, distantibus et irregularibus; dentibus cardinis interni subobsoletis.*

Shell ovate, oblique, convex, smooth; left valve with the umbo oblique, nearly mesial; hinge line nearly straight, short, the anterior extremity rounded, auricles small; right valve more flattened, the umbo small; external sulci of the hinge three, large, wide, distant and irregular; internal hinge teeth scarcely distinguishable.

The valves are always separated and delicate, the test being usually but imperfectly preserved; the younger specimens are shorter in proportion, and the hinge line exceeds half the length of the valves; but in others of large dimensions it is less than half the length. Owing to its delicacy it is seldom that the hinge can be exposed, but independently of this, it entirely wants the anterior hiatus and corrugation which exists in *Avicula* and *Perna*, from the latter genus, indeed, the character of the surface is different, and it does not possess the squamous structure of the *Pernæ*.

*Localities.* The whole of the Minchinhampton district, in the shelly beds of which it is moderately common, more especially about the middle of the shelly series. Also at Stonesfield, Oxfordshire.

#### Section b'.

GERVILLIA MONOTIS, Deslongchamps. Tab. II, fig. 14, 14a, b.

GERVILLIA MONOTIS, Deslongchamps. Mem. Soc. Linn. Calvados, tom. i, 1824, t. 5, f. 2.

*Testá elongatá, subarcuatá, valvâ sinistrâ convexá; umbone antico, subterminali; laminis incrementi impressis; valvâ dextrâ planá, interdum concavá, umbone terminali, depresso et acuto; margine cardinali obliquo in auriculo postico acuto, producto. Cardine foveis (5) subremotis, dentibus interni duobus, magnis, anticis.*

Shell elongated, somewhat bow shaped, left valve convex; umbo anterior, oblique, almost or completely terminal, prominent, and impressed with laminæ of growth; right

valve flat, sometimes concave, its umbo terminal, depressed, and acute; hinge line very oblique, elongated posteriorly, and produced into an auricle. Hinge with five large and rather remote sulci; internal teeth two, large and anterior, margins of the valves sinuated.

This species forms a link connecting two very dissimilar groups of *Gervillia*; it possesses the characteristics of the second or contorted group in a more modified form than *G. Hartmanni*, Goldfuss, or *G. tortuosa*, the *Gastrochaena tortuosa* of Phillips; these two latter species pertain to the Inferior Oolite, and the present one to the Great Oolite. The degree of contortion varies considerably in individuals; the young specimens have a very lengthened hinge line; the lines of growth are strongly marked upon the left valve, and there are two short obscure ribs diverging from the umbo, these, however, disappeared in the progress of growth, and the posterior extremity became more produced.

The right valve is more delicate, and is found more rarely than the other; the same circumstance occurs likewise in Normandy, where M. Deslongchamps had not seen the right valve when he described this species. It ranks as one of the most abundant and characteristic bivalves of the Great Oolite; it occurs indifferently in all the shelly beds.

*Localities.* Minchinhampton; Normandy.

GERVILLIA CRASSICOSTA. Tab. II, fig. 9.

*Testá valde obliquá, elongatá, convexiusculá, auriculo antico rotundato, postico truncato et brevi; costis radiantibus subundatis, elatis majoribus 8, alternatim minoribus, et cum striis transversis numerosis, indentatis, latero postico elongato: valvá dextrá ignotá.*

Shell very oblique, elongated, convex, anterior auricle rounded, posterior auricle short and emarginated; radiating costæ slightly waved, elevated, the larger 8 in number, distant, and alternating with as many smaller, and impressed with numerous rather indistinct transverse striæ: posterior and inferior extremity elongated and slightly acuminate: right valve unknown.

Of this rare species we have only obtained three examples; the hinge border is much shorter than in *Pteroperna costatula*, the posterior wing being but little produced; the whole contour of the shell is very oblique, and the larger costæ are very prominent; the greater degree of obliquity, convexity, and alternation of the costæ, readily serve to distinguish it from *P. costatula*.

*Locality.* Minchinhampton Common.

GERVILLIA RADIAN. Tab. VI, fig. 10.

*Testá magná crassá inæquivalvi valde contortá, valvá sinistrá arcuatá, umbone magno incurvo, valvá dextrá oblique-concavo, umbone depresso; margine cardinali elongato subhorizontali, auriculis prominulis; lateribus lineis radiantibus paucis obscuris; aliis concentricis dense dispositis.*

Shell large, very thick, inequivalve, very much contorted, the left valve very convex,

arched, with the umbo large and incurved; right valve oblique and concave, its umbo depressed; hinge margin elongated, nearly horizontal, with prominent auricles; the surface of the convex valve has a few obscure radiating lines decussated by others, which are concentric, irregular, and very densely arranged.

The general aspect has a considerable resemblance to *Gervillia Hartmanni* (Goldfuss), but it is more contorted than that shell; the valves are shorter, the diameter through them is greater, and the hinge line is so much less oblique as to be nearly at right angles to the axis; owing to this figure and the length of the hinge line, the posterior auricle projects considerably.

*Locality.* Morcot, Rutlandshire.

#### INOCERAMUS. *Park.* 1811.

INOCERAMUS, CATILLUS, MYTILOIDES, *Brong.*

*Gen. Char.* Shell inequivalve, sub-equilateral, ovately trigonal, umbones prominent, incurved; hinge straight, nearly horizontal, consisting of a series of transverse parallel teeth in each valve; substance of the test fibro-lamellar.

INOCERAMUS? OBLIQUUS. Tab. VI, fig. 12.

*Testá ovato-obliquá subdepressá, subæquivalvi, umbonibus prominulis subæqualibus, margine cardinali brevi obliquo, margine anteriore et inferiore curvato, posteriore subsinuato; lateribus plicis concentricis elatis, angustis inæqualibus et irregularibus, interdum sub-acutis.*

Shell ovate, oblique, rather depressed, subæquivalve, umbones prominent, nearly equal, hinge margin short, oblique, anterior and inferior margins gracefully rounded, posterior border slightly sinuated; the sides of the valves concentrically plicated; the plications are elevated and narrow, irregular and unequal, sometimes acute; the substance of the shell is thin. It is more oblique, wider, and less pointed than the *I. cinctus* from the Oolite of Ireland, and more depressed than any other Oolitic species with which we have compared it; the valves are thin, frequently in opposition, and are more or less compressed and distorted; the surface is smooth, shining, and is destitute of any striations.

Length,  $2\frac{3}{4}$  inches; breadth,  $2\frac{1}{4}$  inches; diameter through both the valves about  $1\frac{1}{4}$  inch.

*Locality.* Morcot, Rutlandshire.

INOCERAMUS FITTONI. Tab. IV, fig. 14.

? INOCERAMUS AMYDALOIDES, *Goldf.* Pet., t. 115, f. 4.

*Testá tenui ovato-acutá depressá: margine cardinali obliquo posteriore subrecto; umbonibus subacutis, rugis concentricis inæqualibus et irregularibus.*

A somewhat oval, depressed, and thin shell, with the hinge margin oblique, and rather prominent umbones; surface irregularly undulated.

A shell presenting considerable resemblance in form to *I. amygdaloides*, Goldf., but we have only been enabled to compare it with casts of that species which is found in the Lias of Germany.

*Locality.* Stonesfield, Oxfordshire, where it occurs but rarely.

PERNA, Brugière, 1791.

*Gen. Char.* Shell flattened somewhat irregular, with terminal depressed umbones, hinge linear marginal, with numerous parallel ligamental pits; byssal sinus anterior placed a little beneath the umbones, and slightly gaping, its margins thickened; muscular impression oval and situated rather posteriorly; texture of the shell fibro-lamellar.

PERNA RUGOSA. Tab. III, fig. 1.

? PERNA RUGOSA, Goldf. Petref. 2. t. 108, f. 2.

*Testá subquadrátá, complanátá, rugosá, tenui, umbonibus acutis, lineá cardinali horizontali; laminis superficiei scabris irregularibus.*

Shell subquadrate, flattened, rugose, thin, with acute umbones, hinge line horizontal and of moderate length; laminæ of the surface rough and irregular.

The general figure possesses a considerable resemblance to *P. rugosa*, Munst. (Goldf. Petref., t. 108, fig. 2,) our specimen is, however, more compressed, and the umbones less prominent, the test is also somewhat thin. The tenuity of the test affords a striking contrast to several massive Inferior Oolite species, whose general contour is not very dissimilar.

*Locality.* Minchinhampton Common, where it occurs very rarely in the bed of coarse planking. The *P. quadrata*, Phil. is probably identical with this species.

LIMA, Brug., 1791.

PLAGIOSTOMA, Sp., Sow.

*Gen. Char.* Shell subequivalve, inequilateral, oblique, aurited, hinge margin oblique, thickened within, forming a transversely flattened plate, in which and beneath the umbones is a triangular depression, destined to receive a ligament which is partly internal.<sup>1</sup>

<sup>1</sup> In an interesting communication read before the Linnean Society of alvados, (December, 1830,) Professor E. Deslongchamps stated the general reasons for uniting the species of *Plagiostoma* to *Lima*. In this memoir, not yet we believe fully published, M. Deslongchamps described seventeen species of *Lima* from the Jurassic strata of Calvados, and arranged them under four sections:—

1. Margins of the valves entire, not serrated, lunule distinct: *L. gigantea, heteromorpha*.
2. Margins of the valves sinuato-dentate, lunule distinct: *L. sulcata, variabilis, radiata, punctata*.
3. Margin of the valves serrated, lunule distinct: *L. elliptica, lucida, pulchella, uniaurita, typus, leviss, semistriata*.
4. Margins of the valves sinuato-angular, no lunule: *L. alternans, duplicata, gibbosa, exigua*.

It may be conveniently divided into the following groups :

- a.* Species with the umbones divergent, having between them a triangular area, borders of the valves rounded, lunule distinct and gaping.
- b.* Umbones approximate, borders of the valves rounded, lunule small and closed.
- c.* Species more flattened and elongated, or chisel shaped, the borders of the valves truncated, lunule gaping, its borders folded backwards.
- d.* Umbones approximate, borders of the valves truncated anteriorly, lunule closed.

Our Great Oolite species will be found to contain examples of each of the foregoing groups.

LIMA DUPLICATA, *Sow.*, sp. Tab. III, fig. 6, 6 *a.*

PLAGIOSTOMA DUPLICATA, *Sow.* Min. Con., t. 559, f. 3, 1827.

? — PECTENOIDES, *Zieten.* Wurt., p. 92, t. 69, f. 2.

LIMA ALTERNICOSTA, *Buvignier.* Geol. de la Meuse, p. 22, t. 18, f. 11—13.

*Testá convexá oblique-ovatá, anticè abrupti truncatá ad cardinem angustatá, postici rotundatá, auriculis parvis subæqualibus; costis 25—28 angulatis, carinatis, sulcis conformibus in imo sulcorum costá minimá ornatis, costis tenuissime transversè striatis.*

Shell convex, obliquely ovate, anterior side abruptly truncate, narrow towards the hinge border, posterior border rounded, auricles small, nearly equal; costæ 25—28, angulated, elevated, the angle being crested with a very fine carina, interstitial spaces wide, conformable, each having a single very fine costa, the costæ and their carinæ are finely and densely striated transversely.

The costæ and sulcations are large upon the middle of the shell and become regularly smaller towards the sides, becoming ultimately only so many fine lines. It is distinguished from *Limea duplicata*, an Inferior Oolite species, by the more oblique form and less elevated and acute costæ. The *Lima alternicosta* of Buvignier, from the Ferruginous Oolite, in the Oxfordian strata of the Department of the Meuse, does not appear to differ from our species in any essential character, except that the figure he has given is somewhat more than usually oblique.

It is one of the most common bivalves in the formation, but it is not often that the fine longitudinal carina upon the costæ is preserved. Height, 1.4 lines; length, 9 lines.

*Localities.* The entire Minchinhampton district of the Great Oolite, also in the Bradford Clay, Forest Marble, and Cornbrash of Wiltshire and Gloucestershire.

(*c.*) LIMA PECTINIFORMIS, *Schloth.* Tab. VI, fig. 9.

OSTRACITES PECTINIFORMIS, *Schloth.* Petref., p. 231, 1820.

OSTREA PECTINIFORMIS, *Zieten.* Wurt., p. 62, t. 47, f. 1.

LIMA PROBOSCIDEA, *Sow.* Min. Con., t. 264, 1821.

— — *Goldfuss.* Petref., p. 88, t. 103, f. 2.

— PECTINIFORMIS, *Bronn.* Leth. Geog., p. 214, t. 19, f. 9, 10, 1851.

*Testá convexá suborbiculari subæquilaterali, concentrice lamelloso-rugosá; costis (11—14,) convexis nodosis tubuliferis, canalibus conformibus, auriculis anterioribus sinuosis hiantibus, lunulá nullá.* (Goldfuss.)

Shell convex suborbicular, nearly equilateral with concentric rugose lamellæ; costæ (11—14,) convex, with nodose and elevated prominent fistulous plications, interstitial spaces conformable; anterior auricles sinuated and gaping, no lunule.

This shell is well known as a constant fossil of the upper ragstones of the Inferior Oolite; it likewise occurs occasionally in the shelly beds of the Great Oolite, and is always very imperfectly preserved, most commonly, only the outer cast remaining, but it never attains the dimensions of the Inferior Oolite specimens, and would seem therefore to have degenerated both in size and thickness.

*Locality.* Minchinhampton Common.

(d.) LIMA CARDIIFORMIS, Sow. Tab. III, fig. 2, 2 a.

PLAGIOSTOMA CARDIIFORME, Sow. Min. Con., t. 113, f. 3, 1815.

*Testá convexá, oblique ovato-orbiculari; anticè truncatá, costis crebris (circa 52—56), convexis æqualibus, canalibus angustis, lineis transversis regularibus crassiusculis, lunulá excavatá.*

Shell convex, oblique, ovately orbicular, anterior side truncated, costæ numerous (about 52—56,) convex, equal, the interstitial spaces narrow, with transverse, regular, and prominent lines, lunule excavated.

The shell is moderately lengthened, the longitudinal always exceeding the lateral diameter, the degree of convexity though varying is considerable, the diameter through both the valves being about equal to two thirds of the length of the shell, the umbones are but slightly curved, and the lunule is but moderately excavated, the valves are closed at their anterior borders, or leave when united the least possible fissure, the hinge border slopes obliquely from the umbones on each side, and the auricles are small; the umbones are but slightly separated, the ligamental area being very contracted. The costæ are regularly rounded, and so closely arranged, as to leave the interstitial spaces deep and narrow, the surface (more especially in older specimens,) are rendered rugose by the transverse striæ, but in this feature, and likewise in the elevation of the ribs, there is much variety, but the number of the ribs is very constant, and assists to distinguish it from *Lima notata*, Goldfuss, in which they are much less numerous, and the interstitial spaces considerably wider, and the convexity of the valve is less; in other respects there is a considerable general resemblance between the two forms. This is the most universally distributed *Lima* of the formation, occurring in every variety of rock, whether composed of sandstone, clay, or shelly limestone.

*Locality.* Minchinhampton and Sapperton.

(c.) *LIMA LUCIENSIS*, *D'Orbigny*. Tab. III, fig. 4.*LIMA LUCIENSIS*, *D'Orbigny*. *Prodrome de Paléontologie*, p. 313, 1850.

*Testá plano-convexá, oblique elongatá, umbonibus acutis depressis, approximatis, auriculis magnis subæqualibus; costis (10 aut 11) magnis plicatis, interstitialibus conformibus.*

Shell compressed or rather convex, obliquely elongated, umbones nearly straight, pointed, and approximated, auricles large, nearly equal and costated longitudinally, the anterior auricle corrugated and gaping. Costæ upon the back of the shell (10 or 11) large, plicated, rounded, with large conformable interstitial spaces.

This species has less obliquity than is usual with the *Limæ*, and this character will always serve to distinguish it from *Lima angusta*, Buvignier, t. 18, f. 27, which occurs in the middle portion of the Inferior Oolite in Gloucestershire, the character of the costæ in that species is very similar but more curved, the shell is always very oblique, its anterior side or lunule being concave. Compared with *Lima substriata*, Goldfuss, our species is much more elongated, has fewer costæ, and has not the distinctly raised murications or plicæ by which the costæ of that species are ornamented. It is somewhat rare, but occurs in several of the shelly beds.

*Locality.* The Minchinhampton district.

(d.) *LIMA GIBBOSA*, *Sow.* Tab. III, fig. 7, 7 a.*LIMA GIBBOSA*, *Sow.* *Min. Con.*, t. 152, 1817.— — *Bronn.* *Leth. Geog.*, 213, t. 19, f. 11, 1851.— — — *Index Palæont.*, p. 645, (not Goldf.?)

*Testá convexá ovato-subobliquá, elongatá, fornicatá, umbonibus magnis approximatis, dorso costato; costis (11—13) elevatis acutis, canalibus conformibus; striis tenuissimis, transversis decussatis.*

Shell ovate, slightly oblique, convex, elongated, ribbed, umbones large and contiguous, back of the shell with acute, elevated costæ from 11 to 13 in number, with conformable interstitial spaces; the entire surface has very fine transverse striæ.

The sides of the shell are destitute of costæ, the smooth surface being about equal in extent to that which is costated. This species is perfectly distinct from the *Lima gibbosa* of Goldfuss, which is more oblique, the costæ are curved, they extend even upon the posterior sides of the valves, and their number is more than twice as great as in our own or Sowerby's species. In the shelly beds of the Great Oolite it occurs very rarely in single valves, and never equalling half the size which it attains in the Inferior Oolite, but in the seams of clay which are associated with Stonesfield slate, casts are found of the full dimensions, and with the valves in apposition.

*Localities.* Minchinhampton Common; Ancliff, Wiltshire.

## (b.) LIMA SEMICIRCULARIS, Goldf. Tab. III, fig. 3, 3 a.

LIMA SEMICIRCULARIS, Goldfuss. Petref., t. 101, f. 6.

PLAGIOSTOMA SEMICIRCULARIS, Quenstedt. Wurt., p. 477.

*Testá convexá, oblique semicirculari, anticè truncatá, costulis crebris æqualibus convexis, canalibus interstitialibus angustioribus concentrice confertim striatis, lunulá plano-concavá.*

Shell moderately convex, obliquely semicircular, anterior side straight, truncated, ribs closely arranged, very numerous, convex, the interstitial spaces more narrow, and impressed with very delicate striæ; lunule flattened, or slightly excavated, umbones approximated, pointed, auricles small, hinge border straight.

This species has some general resemblance to young specimens of *Lima cardiformis*, but may be distinguished from it by the more elongated, depressed, and less oblique form, and more especially by the more pointed and depressed umbones, the costæ also, contrary to that species, are often slightly undulated, and the lines of growth form two or three prominent rounded elevations. The average size is about an inch in length. It is moderately abundant in the shelly beds.

*Locality.* The whole of the Minchinhampton district.

## (c.) LIMA OVALIS, Sow. Tab. III, fig. 5, 5 a.

PLAGIOSTOMA OVALIS, Sow. Min. Con., t. 114, f. 3, 1815.

LIMA OVALIS, Goldf. Petref., t. 101, f. 4.

*Testá convexá oblique ovatá, anticè truncatá, costulis convexis æqualibus crebris, sulcis interstitialibus transversim lineatis, lunulá concavá.*

Shell ovate, moderately convex, umbones pointed, auricles very small, anterior border nearly straight, the side steep and rounded, posterior border curved nearly in a semicircle; costæ convex, but very densely arranged, equal and marked with extremely delicate transverse striæ, the interstitial spaces are very narrow and punctated.

The costæ are equal and waved, but so fine as scarcely to be traced without the aid of a magnifier, the auricles in size are reduced almost to nothing. The general dimensions nearly accord with *Lima semicircularis*, but it is more convex and oblique, the anterior side being more steep and rounded.

*Locality.* It is not very abundant, but occurs throughout the shelly beds of the formation over the Minchinhampton district, and likewise at Ancliff.

## (d.) LIMA IMPRESSA. Tab. III, fig. 8, 8 a.

*Testá convexá obliquá, ovato-orbiculari, anticè truncatá, costulis depressis, irregularibus sulcis angustis interstitialibus undulatis, punctis crebris impressis, et striis transversalibus tenuissimis notatis. Striis incrementi paucis distantibus.*

Shell convex oblique, ovately-orbicular, anterior side truncated, costæ depressed, of

irregular width, with very narrow and waved interstitial sulcations, which are impressed with densely arranged punctures; the surface of the shell has likewise very fine transverse striæ. Striæ of growth few and distant.

This shell is moderately convex, the lateral and longitudinal diameters are nearly equal, the umbones approximate and the auricles are small, the substance of the test is thin, and the surface, except in young specimens, is usually distorted or crushed, so that it is nearly impossible to obtain a large specimen which has not suffered in the process of fossilization. The longitudinal elevations are so slight as scarcely to be considered costæ, their surfaces are smooth, shining, and so much flattened, as scarcely to impress a sensible convexity to the touch. The numbers of the irregular costæ vary from 40 to 48, they are equally distinct upon every part of the shell, a feature which will always distinguish it from *Lima gigantea*, and analogous species. *Lima læviusculá*, Deshayes, approximates to our species, but is destitute of the dense punctations which mark the interstitial spaces; the interstitial sulcations are likewise evanescent upon the middle of the valves, which is not the case with our shell. *Lima aciculatá*, Goldfuss, approaches this species in the character of its markings, but it is much more flattened, and the costæ are regular and more numerous.

This species is nearly as abundant as the *Lima cardiiformis*, which it everywhere accompanies, but very frequently only in a crushed condition; it is shorter than the other and scarcely so convex.

(d.) LIMA BELLULA. Tab. III, fig. 9.

*Testá ovato-obliquá, lævigatá; anticè convexá, abruptè truncatá posticè subcompressá, rotundatá; auriculis parvis inæqualibus; lunulá magná excavatá; superficie striis radiantibus tenuibus, nonnunquam obsoletis; striis anticis distinctis subdistantibus, posticis crebris evanescentibus.*

Shell ovate, oblique, smooth; anterior side convex, abruptly truncated; posterior side rather compressed, its margin rounded; auricles small, unequal; lunule large and deeply excavated; the surface is ornamented with very delicate radiating striations, which anteriorly are distinct and rather distantly arranged, posteriorly they become much more closely arranged and are usually indistinct.

The general aspect of this species is shining and smooth, so that it is only upon close examination that it is discovered to have radiating striations; in young specimens these are always more or less visible, but in specimens of advanced growth only a few traces of the anterior striations remain. The concentric lines of growth are usually strongly marked and efface the striations.

With advance of growth some change is observable in the contour of the shell, it becomes more transverse and nearly orbicular.

Specimens from the Great Oolite of Lincolnshire do not attain to one third the linear dimensions of others from the Inferior Oolite of the Minchinhampton district, but it does not occur in the Great Oolite of Gloucestershire.

*Localities.* Barnack, Northamptonshire; Ponton, Lincolnshire; Culver Hill, on the western side of Minchinhampton Common, in the Inferior Oolite.

PINNA, *Linn.* 1758.

*Gen. Char.* Shell longitudinal, wedge shaped, acute anteriorly, truncated and gaping posteriorly; umbones straight, terminal and pointed; hinge lateral, linear, and without teeth; ligament marginal, linear, elongated, and partly internal; muscular impressions two, the anterior or byssal one minute, the posterior large. Substance of the shell thin, structure fibro-lamellar, composed of two layers, of which the exterior one is fibrous, the interior lamellar.

PINNA AMPLA, *Sow.*, sp. Tab. IV, fig. 14.

MYTILUS AMPLUS, *Sow.* Min. Con., t. 7, 1812.

PINNA AMPLA, *Goldfuss.* Pet., t. 129, f. 1.

— — *Deshayes.* Lam. An. s. Vert., 2de ed., vii, p. 68, 1836.

— — *Bronn.* Index Palæont., p. 977.

*Testá mytiliformi, mediocrè gibbosá, costellatá; costellis irregularibus, subplanis, undulatis, plurimis dichotomis aut confluentis et nodosis, striis transversis crebris et laminis incrementi impressis: umbonibus obtusis plerumque costellatis.*

Shell triangular, moderately gibbose, longitudinally costated; costellæ numerous, very irregular, waved, for the most part bifurcated, confluent, knobbed and impressed with transverse striæ, which are very fine and closely arranged, and likewise by the laminæ of growth which are irregular. The hinge is straight, short, oblique, forming an angle of 45 degrees with the anterior border, the umbones are obtuse and usually costellated.

The radiating little ribs are but slightly elevated; they are tolerably distinct upon the anterior part of the shell, but posteriorly, where the folds of growth are larger, they become very irregular, confluent, or vanish altogether, a change exactly similar to that exhibited in the progress of growth of some recent *Pinnas*; in fact, well-preserved specimens of *Pinna ampla* are sometimes obtained, which are quite destitute of the longitudinal costellæ, and retain only the folds of growth. The substance of the test is thicker than is observed in recent shells of this genus.

It occurs rarely in the shelly beds of the Great Oolite, but more frequently in the Stonesfield slate of Gloucestershire.

*Localities.* Minchinhampton Common, in Great Oolite; Sevenhampton Common, in the Stonesfield slate; Wiltshire, in the Cornbrash.

In the Stonesfield slate of Stonesfield, Oxfordshire, and also in the Oolite of Mitford, Somersetshire.

PINNA CUNEATA, *Phillips*. Tab. VI, fig. 11.

PINNA CUNEATA, *Phillips*. Geol. Yorksh. i, t. 9, f. 17, 1835.

*Testá elongatá, subcurvatá, quadriquetrá, latere antico convexo, postico compresso, margine acuto et excavato; superficie lineis undulatis radiantibus subnodosis aliis concentricis decussatis.*

Shell elongated, somewhat curved, four sided, anterior portion convex, its margin convex, posterior portion compressed, its margin acute and excavated; the entire surface with undulating knotted radiating lines crossed by others concentrically disposed.

The concentric lines are very irregularly disposed, being much more closely arranged and indistinctly marked as the shell increased in size, at first they are not more numerous than the radiating lines. Length about  $3\frac{1}{2}$  inches, basal diameter  $2\frac{1}{4}$  inches, diameter through both the valves, 13 lines. In Gloucestershire, it occurs only in the upper division of the Inferior Oolite.

*Localities.* In the slaty Oolite of Easton and Collyweston, Northamptonshire, and in Lincolnshire; in the Cave Oolite of Yorkshire.

#### TRICHITES, *Lhwyd*, 1699.

TRICHITES, *Plot*, 1676; *Lhwyd*, 1699; *Guetard*, 1750; *Defrance*, 1828; *Pictet*, 1845; *Lycett*, 1850; *Deshayes*, 1851.

TESTA INCERTI GENERIS, *Woodward*, 1723.

PINNIGENE, *Deluc*, 1799.

CATILLUS, Sp., *Pusch*, 1836.

PINNA, Sp., *Deshayes*, 1835.

PINNIGENA, *D'Orbigny*, 1851.

*Gen. Char.* Shell of fibrous structure, thick, inequivalve, inequilateral, subquadrate, the valves anteriorly forming a prominent and somewhat pointed apex curved obliquely forwards. The left or larger valve convex and very thick, its apical extremity hollowed internally, and forming with the corresponding portion of the other valve a funnel-like cavity, which is more or less open at its extremity; the right valve is thinner and flattened, or sometimes somewhat concave; the margins of the valves are very irregular and sinuated, but fit closely together all round, and there is always a large flexure upon the posterior side of the shell, forming a wide depression in that portion of the larger valve and a corresponding elevation in the smaller valve. The hinge border is very irregular and sinuated, it is nearly horizontal, lengthened, and internally without teeth, or any testaceous thickening. The interior side of the larger valve is much thicker than the other, its border is excavated beneath the apex, and is somewhat corrugated. The muscular impression is single, large, subcentral, and strongly impressed, its circumference has concentric step-like ridges. Ligament probably linear and subinternal, as in *Pinna*.

The individuals of a species vary much in the convexity of the valves and in the

character of the surface, so that species are not easily discriminated; the costæ, nodules, or other elevations which are occasionally present upon the surface, become indistinct or even vanish altogether; but their broad flexure upon the posterior side and their irregular sinuous hinge border are invariably conspicuous.

The structure of the test consists of closely-packed perpendicular fibres of a columnar aspect, which are traversed transversely by calcareous laminæ of extreme tenuity, parallel to each other, and sometimes of a colour different from the rest of the shell; they occur at very uncertain distances, appearing in the sections as so many fine lines, these thin laminæ give both to the external and internal surfaces of the valves a perfectly smooth appearance, and in some sections a dozen or more of them may be counted, they indicate successive additions of thickness to the test during the growth of the animal. The muscular impression exhibits the mode of growth in a very clear manner, the necessary addition of perpendicular fibres around its circumference producing a sudden elevation, or step like surface at the border of every successive zone of increase. The position of the muscular impression is rather posterior to the centre of the valves, or nearer to the posterior and superior border; there may also usually be observed upon the inner surface of the flat valve, at a little distance from the anterior border and parallel to it an elongated swelling, or rounded prominence, having exactly the contour of the outer border, and exhibiting the appearance of having formed the outer border at a former stage of growth, a feature precisely similar to that which is observed in certain oysters. The irregular swellings upon the surfaces of the valves do not coincide with the surface of the interior, sections of the thicker specimens often exhibit this circumstance in a very striking manner, and likewise a general irregularity and inequality in the thickness of the test; the inner surfaces of the valves, though smooth, are singularly uneven, and it is not uncommon to observe an occasional thickness in the test of seven or eight lines, terminate towards the posterior border in a considerable degree of tenuity and delicacy. It would seem that the transverse laminæ, whatever may have been their original structure, impeded fracture only to a very limited extent, for we find that in most cases the fracture is directly across all the laminæ, occasionally indeed the fracture has been arrested at the surface of one of the laminæ, and has followed the plane of its surface for some distance, an indication that its structure was lamellar. The fibrous structure then was very fragile, in the fossil state, fracture in the direction of the fibres takes place upon any slight concussion, however thick may be the test; and with the living shells the same circumstance seems to have obtained, for in the majority of instances, *Trichites* acquired its fossil state in the condition of fragments only, and these occur in such numbers, both in the Great and Inferior Oolite, as to indicate that this genus occupied a very prominent position amongst the marine fauna of the lower Oolitic epoch. The valves of *Trichites* (more especially the older and thicker specimens), are perforated, and sometimes literally honeycombed with little crypts of *Lithophagida*, in which, occasionally, the valves of the shells may be discovered; these perforations are a constant feature pertaining to *Trichites*, from whatever formation or bed

it is obtained, and a little search discloses the crypts in such extraordinary numbers, as to indicate that the *Lithophagidæ* then existed in a force which would not have been expected from the small number of instances in which their tests are preserved. In the shelly beds of the Great Oolite, the convex valve of *Trichites* is usually covered, and even loaded with small adherent oysters; but through these masses the perforations of the *Lithophagidæ* are found to have passed, a sufficient proof that the operations of the latter mollusks commenced posterior to the occupation of the adherent shells, and leading to an inference that the latter may have pertained to the living examples of *Trichites*. Our Great Oolite examples of the genus convey but a very inadequate idea of the magnitude which it sometimes attained; the upper division of the Inferior Oolite has disclosed sections of the valves upwards of two feet in length, and two inches in thickness. A shell imbued with such peculiar fragility, must have been unfitted to exist upon the bed of a littoral deposit exposed to the attritions and accidents to which such a position must have been incident, but in which, nevertheless, we find their remains; it seems more probable that they lived like the *Myadæ*, buried and defended in mud or sand, and that it was only by the denuding action of currents that their shells became exposed, and rolled with other fragmentary bodies.

In seeking for the generic forms allied to *Trichites*, we are reminded of the *Catilli*; the structure of the shell is alike in both genera, and the general figure is not very dissimilar, but the regularity of one contrasts with the irregularity of the other; the character of the surface more especially is distinct, the regular concentric folds of the *Catilli* have no affinity with the nodose and laminated surface of *Trichites*, nor can the recurved solid umbones and thick crenulated hinge plate of the former genus find any similitude with the *Pinna* like termination of *Trichites*. But if the character of the apex be allowed to resemble that portion of *Pinna*, we may search in vain for any other point of affinity with that genus; the structure of the shell in each differs materially; in *Pinna* it consists of two distinct layers, the external one of which is fibrous, but the internal is that of ordinary shell or nacreous, a structure tending to obviate the fragility which pertains to the fibrous structure of the outer layer, and very much resembling a method practised in the mechanical arts, for giving increased strength to thin layers, in substances whose fibres pass in different directions; by this contrivance, a shell very thin is made to possess a considerable degree of elasticity and strength; the other particulars, in which *Pinna* differs from *Trichites*, embrace every remaining generic character, as the equivalve form, its regularity, the gaping truncated posterior extremity, and lastly, the muscular impressions, of which *Pinna* has two. The preceding comparison with *Pinna* has been made in consequence of several authors, who confessedly had acquired only a very imperfect knowledge of *Trichites*, having classed the *Pinnigene* of Deluc, with *Pinna*, under the name of *Pinna Saussurei*.

It is now known that *Trichites* is abundant in the Oolitic rocks of England, and is found over extensive areas, but it is not confined to one of the Oolitic formations merely, as

there are other species which are nearly unknown to science; these circumstances, it is trusted, will sufficiently incite the industry of local collectors, and that ere long our knowledge of this obscure form will be augmented. On referring to the earliest notice of *Trichites*, we find that it dates even to the period when fossil shells were regarded as mere sports of nature, as the product of a supposed plastic power possessed by inorganic matter. Dr. Plot, in his 'Natural History of Oxfordshire, 1676,' applied the term *Trichites* to fragments of these shells, and figured a specimen in pl. 7, fig. 7; these he regarded merely as mineral curiosities. To Lhwyd is due the merit of having discovered their true position in the animal kingdom, and their distinctness from all known shells of Mollusca. He described in his 'Lithophylacii Britannici,' several species from the Coralline Oolite of Oxfordshire, a fact the more remarkable, when it is remembered that more than a century afterwards the majority of systematic writers omitted the genus altogether from their works, or confessed their imperfect acquaintance with it. In Woodward's 'Catalogue of British Fossils, 1723,' it seems to have been confounded with the *Catilli* of the cretaceous rocks, and is placed with the "Testæ incerti generis." Guettard recognised it in the Oolite rocks of Normandy, and mentioned it under the name of *Trichites*.

Deluc, in the great work of Saussure, 'Voyages dans les Alpes,' i, p. 192, made it a new genus, under the name of *Pinnigene*, and figured a species which has not been recognised in this country; he does not seem to have been aware of the identity of *Pinnigene* with the *Trichites* of Lhwyd. The article *Trichites*, in the 'Dictionnaire des Sciences Naturelles,' tom. iv, contributed by DeFrance, contains a digest of all the information which had been acquired respecting this obscure form. Deshayes, in the 2d edition of Lamarck, 'Anim. s. Vert.,' tom. vii, p. 68, refers Deluc's species to *Pinna*, under the name of *Pinna Saussurei*, but states however that he had never seen a perfect specimen. Pusch, in his 'Polens Paleontologie, 1835,' page 45, offers some remarks upon fragments which he had detached from the rocks of the middle Oolite at Brzegi and Koritricz, but having no knowledge of the entire form, he refers the fragments to *Catillus*. Pietet, in his 'Traité Élémentaire de Paléontologie,' allows the generic value of *Trichites*, and reproduces the figures of Deluc reduced in size. Lastly, the reader is referred to a notice of this genus in the 'Annals and Magazine of Natural History for 1850,' p. 347, by one of the authors of this monograph.

**TRICHITES NODOSUS, Lycett.** Tab. III, fig. 11.

TRICHITES NODOSUS, *Lycett.* Ann. and Mag. of Nat. Hist., 1850, p. 347, t. 10.

— — *Brom.* Leth. Geog., p. 221, t. 20, f. 1, 1851.

*Testá subquadrata, convexá, valvis valdè inæqualibus, valvá sinistrá convexá, valvá dextrá concavá; valvis varicibus subradiantibus irregularibus interdum dichotomis. Valvá minorá nodis nonnullis irregularibus. Apices valvarum attenuatæ et obliquæ.*

Shell subquadrate, convex, the valves very unequal, the left valve being very convex or

gryphoid, the right valve somewhat concave; the valves ornamented with irregular varices, sometimes dichotomous, and imperfectly radiating. The smaller valve has a few unequal nodules upon the varices. Apices of the valves oblique and attenuated.

The thickness of the larger valve is moderate, the smaller valve is rather thin; specimens vary much in the convexity of the larger valve and in the varices, the latter being sometimes not distinguishable; the apices are much produced, attenuated, and curved forwards, more especially that of the larger valve. The almost constant manner in which the larger valve is loaded with adherent shells is a considerable obstacle to the determination of species, this, together with some variation in the figure of the valves, suggests doubts which are only to be removed by a comparison of numerous specimens.

Height,  $5\frac{1}{2}$  inches; opposite diameter,  $4\frac{1}{2}$  inches; diameter through both the valves,  $2\frac{3}{4}$  inches.

*Localities.* Minchinhampton Common, where it is not unfrequent; Scar Hill, near Nailsworth, in the freestone of the Inferior Oolite, where it occurs very rarely.

In the Great Oolite of Comb Down, near Bath. (Museum of Practical Geology, presented by Mr. S. P. Pratt.)

### MYTILUS, *Linn.*, 1758.

#### MYTILUS et MODIOLA, *Auct.*

*Gen. Char.* Shell longitudinal, oblique; umbones terminal or subterminal. Hinge lateral, linear, and without teeth, ligament marginal and somewhat internal, muscular impression elongated, club shaped, and placed somewhat laterally; anterior impression very small.

#### MYTILUS SOWERBYANUS, *D'Orb.* Tab. IV, fig. 1.

MYTILUS SOWERBYANUS, *D'Orb.* Prod. Pal. i, p. 282, 1850.

MODIOLA SOWERBYANA, *Bronn.* Leth. Geog., p. 233, t. 15, f. 13, 1851.

— Plicata, *Sow.* Min. Con., t. 248, f. 1, 1819.

— — *Zeiten.* Petref., t. 59, f. 7, 1835.

MYTILUS Plicatus, *Goldf.* Petref., p. 175, t. 130, f. 12, 1840.

*Testá elongatá, soleniformi, anticè angustá, obtusá, posticè dilatatá, angulo obliquo tenui bipartitá, parte inferiore et anticá levigatá, superiore et posticá arcuatim plicatá.*

Shell elongated, pod-shaped, anterior part narrow and obtuse, posterior dilated, divided into two portions by a thin oblique angle, inferior and anterior part smooth, superior and posterior part with numerous curved folds.

The hinge margin is very much elongated and slightly curved, the inferior border is slightly concave and acute. The short costæ upon the superior border are parallel, oblique, and are impressed with numerous densely-arranged curved lines, which upon the lower portion of the shell are parallel with the inferior border.

Our Great Oolite specimens must be considered as a variety of this well-known shell, they are much attenuated at the anterior extremity, and unusually expanded and compressed at the posterior extremity. It occurs rarely in the Stonesfield Slate, and has not been observed in the shelly beds of the Great Oolite.

*Localities.* In the slaty beds at Minchinhampton Common; Stonesfield, Oxfordshire. Also in the Upper Marly deposits of the Great Oolite at Felmersham, Bedfordshire, and Blisworth, Northamptonshire.

M. D'Orbigny has changed the generally known name given to this species by Mr. Sowerby, as Gmelin had previously described a recent species under the name of *Mytilus plicatus*.

MYTILUS (MODIOLA) TENUISTRIATUS, *Munst.* Tab. IV, fig. 6.

MYTILUS TENUISTRIATUS, *Goldfuss.* Petref., t. 131, f. 5, 1840.

— — — *Buckman.* Geol. Cheltenham, p. 69, t. 3, f. 3.

*Testá ovato-cordatá, fornicato tenuissime concentricè striatá, umbonibus terminalibus arcuatis, margine cardinali recto, brevissimo, dorso alto angusto, latere inferiore cordato, anticè subventricosó. (Goldfuss.)*

Shell ovately cordate, short, very convex; umbones terminal acute and curved forwards, hinge border straight and short, dorsal surface very much elevated and narrow, inferior border sinuous, its anterior portion rather ventricose; concentric striations regular, fine, and closely arranged.

This is a short, obtuse shell, and the convexity of the valves is so considerable that the diameter through them, when in apposition, is nearly equal to their length; the striations are very delicate, and the test thin.

*Locality.* For this pretty species we are indebted to the kindness of Professor James Buckman, who collected it in a bed of yellow Clay at Sevenhampton, together with numerous other testaceous relics, which though numerous in species, are for the most part badly preserved. It is probable that this stratum, which can be traced for two miles and upwards, is a subordinate local deposit of the Great Oolite; at Sevenhampton, it is situated 22 feet above the Stonesfield Slate.

MYTILUS TUMIDUS. Tab. IV, fig. 5.

*Testá arcuatá, inflatá, striatá concentricè rugosá, margine cardinali curvato, margine inferiore concavo, umbonibus terminalibus obtusis, crassis.*

Shell curved, inflated, with rugose concentric striæ, hinge margin curved, inferior margin arched or concave, umbones terminal, obtuse, and thick.

The dorsal surface is very elevated, narrow anteriorly, and more flattened posteriorly; the convexity of the valves is so considerable that the diameter through both is equal to

half the length of the shell, and is greater than the height; the general form is therefore narrow, very convex, and curved elliptically.

It occurs very rarely in the shelly beds of the Great Oolite.

*Locality.* Minchinhampton Common.

*MYTILUS PULCHERRIMUS*, *Roemer, var.* Tab. IV, fig. 12, 12 a.

*MODIOLA PULCHERRIMA*, *Roemer.* Verst., p. 34, t. 4, f. 14, 1836.

— — *Koch and Dunker.* Beitr. Oolith., t. 6, f. 7, 1837.

*MYTILUS PULCHERRIMUS*, *Goldfuss.* Petref., p. 177, t. 131, f. 9.

*Testá ovato-fornicatá, umbonibus postmedianis retusis, margine cardinali recto, latere inferiore convexo, posticè subretuso, lineis radiantibus crebris supernè crassioribus concentricis decussatis.*

Shell ovate, with an elevated dorsal ridge, umbones postmesial, extended backwards, hinge margin straight, inferior side convex, with radiating lines closely arranged upon the superior side, and decussated by very fine concentric lines, which form knots where they cross the longitudinal elevations.

The general figure is subquadrate, the height being equal to half the length, and the diameter through both valves is a little less than the height; the usual length is about four lines; the test is delicate and fragile.

*Localities.* All our specimens have been obtained in the bed of the soft Shelly Oolite, which at Minchinhampton Common underlies the planking. It is moderately rare. Ancliff, Wiltshire, (Mr. J. D. C. Sowerby's Collection.)

*MYTILUS SOLENOIDES.* Tab. IV, fig. 4.

*Testá praelongá, ellipticá, concentricè rugoso striatá, anticè vix angustatá, obtusá, posticè paulum depressá et dilatatá; margine cardinali subrecto, margine inferiore in medio subsinuato.*

Shell elongated, elliptical, gibbose, with rugose concentric striæ, anterior extremity rather narrow and obtuse, posterior extremity more depressed and dilated, hinge margin nearly straight, inferior margin sinuated.

The general aspect has a considerable resemblance to *Mytilus plicatus*, but it is much more gibbose, the diameter through both the valves being upwards of one third of the length, and it is destitute of the posterior plicæ, which distinguish that species; the concentric striæ are very prominent and irregular.

*Modiola elongata*, Koch and Dunker, which is probably *Modiola scalprum*, Sowerby, is also less gibbose.

*Locality.* The Slaty Oolite of Minchinhampton Common, rare.

**MYTILUS SOLENOIDES, var. SUBRENIFORMIS.** Tab. IV, fig. 11.

*Testá crassá subdepressá aut subreniformi, lævigatá, umbonibus obliquis terminalibus, margine superiore arcuato, margine inferiore excavato aut subsinuato, plicis incrementi paucis irregularibus.*

Shell thick, rather depressed, or kidney-shaped, smooth, umbones oblique, depressed, terminal, superior margin curved, inferior margin excavated or somewhat sinuated, folds of growth few and irregular.

The two extremities of the shell are nearly equally rounded and convex, an obscure and obtuse dorsal ridge extends in a curved direction from the umbones to the posterior and inferior extremity; the superior side of the shell has a considerable convexity, and the inferior or ventral side is compressed.

We have only obtained two specimens of this species, which occurred in the soft shelly Oolite which underlies the planking.

Height, 6 lines; length, 14 lines; diameter, through both the valves, 6 lines.

*Locality.* Minchinhampton Common.

**MYTILUS FURCATUS, Goldf., var. BATHONICUS, nob.** Tab. IV, fig. 9, 9 a.

MYTILUS FURCATUS, Goldfuss. Petref., t. 129, f. 6.

— — Roemer. Nordd. Ool., p. 33, t. 18, f. 38.

? MODIOLA ASPERA, Phillips. Geol. York., t. 11, f. 9.

*Testá ovato-acutá, inflatá, umbonibus acutis, margine cardinali subrecto obliquo, latere inferiore abrupto, costis crebris subpapillois interdum dichotomis, lineis incrementi paucis magnis irregularibus.*

Shell ovately acute, very convex, with terminal acute umbones; hinge border straight, or rather oblique, anterior border steep and excavated; costæ numerous, closely arranged and indented with concentric striations, producing a papillary surface, the costæ are waved and occasionally dichotomous. The specimens rarely show the imbricated costæ.

The larger and indented costæ distinguish it from *M. asper*, Sow. It is not uncommon in the shelly beds of the Great Oolite, and varies in length from 3 to 16 lines.

*Locality.* Minchinhampton Common.

**MYTILUS ASPER, Som.** Tab. IV, fig. 8.

MODIOLA ASPERA, Sow. Min. Con., t. 212, f. 3, 1818.

*Testá cuneatá gibbosá, arcuatá longitudinaliter striatá, lineis numerosis radiantibus furcatis, imbricatis; umbonibus incurvis subacutis, margine cardinali arcuato, posteriore subrecto.*

An elongated arched gibbose and longitudinally striated shell, with rather small and curved beaks; striæ numerous, furcate, and minutely imbricated.

Mr. Sowerby remarks, "the small and nearly flat posterior lobe leaves the beaked end of this *Modiola* so small as to give it much of the contour of a *Mytilus*, the depth of the two valves together is greater than the width, and the length is twice the depth. The roughness of the striæ proceeds from minute elevated scales, that are most conspicuous near the margin of the shell, and are nearly obliterated towards the beaks."

It occurs somewhat rarely in the shelly beds of the Great Oolite, and likewise in the marl bed of the Inferior Oolite in the Cotswolds.

*Localities.* Forest Marble of Wiltshire; upper marly beds of Great Oolite, at Felmersham, Bedfordshire; Blisworth, Northamptonshire, &c.; Minchinhampton Common, in the Great Oolite; near Nailsworth and Cheltenham in the Inferior Oolite.

*MYTILUS LONSDALEI.* Tab. IV, fig. 3.

*Testá ovato-oblongá, lævigatá; anticè latá, subdepressá, posticè convexiore, angulo obliquo formante; umbonibus gracilibus incurvis, margine cardinali obliquo, curvato, margine inferiore subsinuato; laminiis incrementi conformibus tenuibus.*

Shell ovately oblong, smooth; anteriorly wide and depressed, posteriorly more convex, divided from the anterior portion by an oblique and obtuse angle, which passes from the umbo to the infero-posterior extremity; umbones slender, incurved; hinge border oblique and curved, inferior border slightly sinuated; the surface has numerous delicate irregular laminæ of growth.

The general figure has some resemblance to *Modiola subæquiplicatá*, Roemer, Verst., tab. v, fig. 7, but the latter shell has greater convexity, the umbones are less attenuated and the oblique angle formed by the anterior depressed surface is less distinct. It has also some resemblance to *M. imbricata*, Sow., but is distinguished by the posterior portion being less expanded and the general form more elongated.

Length, 16 lines; height, 7 lines; diameter, through both the valves, 6 lines.

*Localities.* Sapperton railway tunnel, in the Great Oolite. In the Cornbrash of Wiltshire it is abundant.

*MYTILUS COMPRESSUS, Goldf.* Tab. IV, fig. 7.

*MYTILUS COMPRESSUS, Goldfuss.* Petref., t. 131, f. 11.

*MODIOLA COMPRESSA, Portlock.* Geol. Report, p. 122.

*Testá ovatá subconvexá, concentricè striatá; umbonibus subanticeis, compressis, margine cardinali recto, latere inferiore convexo-plano, posticè subcompresso prorsum rotundato.*

Shell ovate, rather convex, concentrically striated; the umbones subterminal and compressed, hinge margin straight; inferior side moderately convex, posterior side rather compressed and rounded.

The anterior extremity is narrow and somewhat compressed, the posterior much

wider and more expanded, the concentric striæ are very numerous and distinct, the folds of growth are few and irregular.

Height, 7 lines; length, 11 lines; diameter, through both the valves, 4 lines.

*Localities.* It occurs rarely in the shelly beds of the Great Oolite, at Minchinhampton, and more frequently in the slaty or clay beds of the formation, as in the Bradford clay, near Cirencester, and the Stonesfield slate of Oxfordshire.

MYTILUS IMBRICATUS, Sow. Tab. IV, fig. 2.

MODIOLA IMBRICATA, Sow. Min. Con., t. 212, f. 1, 3, 1818.

*Testá ovato-reniformi convexá concentricè striatá, umbonibus subterminalibus arcuatis, dorso anticè angusto, posticè planiusculo, margine cardinali recto, parte anticá lateris inferioris brevi ventricosá.*

Shell ovately reniform, convex, concentrically striated, umbones subterminal, curved, the dorsal convexity is narrow towards the anterior part, and more expanded posteriorly; the hinge border is straight, its length rather exceeding one third that of the entire shell. The concentric lines are very numerous, irregular, strongly marked and imbricated, those near to the posterior side being the most conspicuous.

Proportions of a medium sized specimen: Length, 21 lines; height, 10 lines; diameter, through both the valves, 9 lines. The largest specimens acquire dimensions one half greater.

This is by very much the most abundant *Mytilus* of the shelly beds of the Great Oolite, but the greater number of examples do not exceed 12 lines in length, and the valves are constantly disunited.

*Localities.* Great Oolite, at Minchinhampton; Stonesfield slate of the same district; Bradford Clay and Forest Marble, near Cirencester; also in the upper marly beds of the Great Oolite, in Northamptonshire, Bedfordshire, and Lincolnshire.

MYTILUS SUBLEVIS, Sow. Tab. IV, fig. 19.

MYTILUS SUBLEVIS, Sow. Min. Con., t. 439, f. 3, 1823.

— — Bronn. Leth. Geog., p. 236, t. 19, f. 14.

— — Goldf. Petref. ii, p. 170, t. 129, f. 3.

? MYTILUS JURENSIS, Roemer. Oolith., p. 89, t. 4, f. 10.

? — EDULIS, Young and Bird. Geol. Yorksh., t. 7, f. 10.

*Testá arcuato-cuneiformi, lævigatá, umbonibus terminalibus, acutis, dorso anticè angusto et convexo, posticè expanso, margine superiore arcuato, inferiore concavo.*

Shell curved and cuneiform, smooth, umbones terminal, acute, the back of the shell anteriorly narrow and convex, posteriorly expanded, superior margin curved, inferior margin concave with steep sides; lines of growth few, distant, regular, and strongly marked.

The hinge border is curved, and equal to half the entire length of the shell, the terminal umbones are remarkably acute, without any expansion upon the lower side. It is tolerably abundant in the shelly beds of the Great Oolite.

Dimensions of a medium sized specimen : Length, 23 lines ; height, 12 lines ; diameter, through both the valves, 9 lines.

*Locality.* The whole of the Minchinhampton district ; Felmersham, Blisworth, &c. ; in the marly deposits belonging to the upper portion of the Great Oolite.

MYTILUS BINFIELDI. Tab. IV, fig. 10.

*Testá ovatá subarcuatá concentricè striatá, umbonibus obtusis, dorso fornicato, margine cardinali recto, latere inferiore abrupto antice convexo.*

Shell ovate, superior side compressed, inferior side elevated, with terminal obtuse umbones, hinge margin rather oblique, the greatest convexity is about the middle of the valves, the lower margin is straight, and the general aspect of the shell is smooth.

It occurs rarely in the shelly beds of the Great Oolite.

*Locality.* Minchinhampton Common.

Named in compliment to Mr. W. R. Binfield, who has assiduously collected the fossils of the Oolite.

LITHODOMUS, Cuvier, 1817.

*Gen. Char.* Shell elongated, subcylindrical, anterior extremity rounded and convex, posterior extremity more attenuated, margins of the valves close all round ; umbones anterior, terminal, pointed ; hinge without teeth, ligament internal linear, and placed in a lengthened groove.

*Lithodomus* perforations are extremely common in the shelly beds of the Great Oolite ; they are not, however, confined to the surface of any particular bed, but occur indifferently throughout a considerable thickness of shelly rock, and the more massive bivalves often exhibit their perforations, more especially *Trichites* and *Astarte subquadrata* ; the number of these perforations proves that the *Lithodomi* existed in great profusion, and contrasts singularly with the paucity of the specimens preserved ; we may infer from this fact, that a very qualified degree of dependence should be placed in the number preserved of certain thin and fragile bivalves, as representing the actual number of individuals which existed in the seas of the Oolitic period. The valves which occur in the shelly detritus are well preserved, others which remained in the hollow oval crypts are uniformly very tender and imperfect, they can scarcely be said to be fossilized ; the crypts themselves are for the most part empty, or contain only a little hardened mud ; when, however, the crypts are filled with calcareous spar, it is probable that the living animals themselves were entombed in the deposit.

LITHODOMUS INCLUSUS, *Phil.* Tab. IV, fig. 13, 13 a.

MODIOLA INCLUSA. *Phil. Geol. York.*, i, t. 3, fig. 20, 1835.

— — *Deslongchamps. Mém. Soc. Linn. de Normand*, 1838, pl. 9, f. 39, 40.

*Testá parvá, subellipticá, convexá, umbonibus subanticis, margine postico compresso, producto et curvato, striis concentricis tenuissimis irregularibus, lineis incrementi paucis, distantibus.*

Shell small, delicate, subelliptical, tumid, umbones anterior, nearly terminal, posterior margin compressed, produced, and curved; concentric striæ fine and irregular; lines of growth few, and distant.

This delicate little shell occurs in all the shelly beds of the Great Oolite, more especially in the beds of soft Oolite which underlies the planking, where the numerous cylindrical crypts sometimes contain it; the cavities themselves filled with calcareous spar, elongated and pyriform, are not uncommon; the general figure is much more tumid than is observed in the *Lithodomi* generally. The diameter through both the valves somewhat exceeds the height, and is equal to two thirds of the entire length, which latter rarely exceeds six lines.

*Localities.* Minchinhampton Common; Bisley Common; Ancliff, Wiltshire. It occurs also in the Coralline Oolite of Yorkshire (Phillips).

LITHODOMUS PARASITICUS, *Deslongchamps, Sp.* Tab. IV, fig. 15, 15 a.

MODIOLA PARASITICA, *Desl. Mém. Soc. Linn. de Normand.*, 1838, t. 9, f. 44—46.

LITHODOMUS PARASITICUS, *D'Orbigny. Prod. Paléont.*, p. 312, 1850.

*Testá parvá, tenui, obliquá, costis radiantibus magnis paucisque ornatá, interstiis angustis, umbonibus terminalibus acutis.*

Shell small, thin, oblique, lengthened, with terminal acute smooth umbones, the middle and posterior portions of the shell are ornamented with a few large radiating costæ, the interstitial spaces narrow and deeply depressed; the absence of decussating plications, and the acute apex readily distinguishes it from *Mytilus pulcherrimus*, the only contemporaneous allied species. It has occurred very rarely both in the shelly Great Oolite and Stonesfield Slate.

*Localities.* Minchinhampton; Langrune, Normandy.

Professor E. Deslongchamps records a curious fact connected with the occurrence of this species in Normandy: in a block of stone containing about twenty individuals, each of them occur within the valves of another species, the *Modiola (Lithodomus) inclusa*, which had previously effected their perforations in the limestone. The Rev. H. Jelly has described a somewhat analogous case, as occurring in the Bath Oolite, in which two or three individuals of a species of *Modiola* lie encased in the valves of a *Lithodomus*, that had perforated a coral.

ARCA, *Linn.*, 1758.

ARCA RUDIS, *Sow.* Tab. V, fig. 12.

CUCULLEA RUDIS, *Sow.* Min. Con., t. 447, f. 4, 1824.

*Testá oblongá, subcylindricá, umbonibus magnis antemedianis approximatis, margine cardinali elongato, marginibus aliis arcuatis, costis radiantibus numerosis anticis et medianis acutis, posticis magnis irregularibus subdistantibus, nodosis, lineis concentricis decussatis.*

Shell oblong, subcylindrical, umbones large, contiguous, and placed anterior to the middle of the valves, hinge border elongated, the other margins rounded; radiating costæ acute, elevated upon the anterior and middle portions of the valves, much larger, irregular, more distant and nodose upon the posterior side, decussated by numerous concentric lines.

The posterior side of the shell is rather compressed, and has four or five very prominent irregular knotted costæ; the concentric lines are very fine, and for the most part indistinct. It occurs rarely in the shelly beds of the formation.

Height, 6 lines; length, 12 lines; diameter through both the valves, 6 lines.

*Localities.* Minchinhampton and Bisley Commons; Ancliff, Wiltshire.

ARCA PULCHRA, *Sow.* Tab. VI, fig. 6.

ARCA PULCHRA, *Sow.* Min. Con., t. 473, f. 3, 1824.

*Testá ovato-oblongá, convexá, umbonibus antemedianis subdistantibus, margine cardinali elongato, margine infero parallelo, arcu angustá, lateribus costalis radiantibus crebris subæqualibus, striis concentricis tenuissimis indentatis.*

Shell ovately oblong, convex, umbones anterior, separated, hinge margin elongated, with the inferior margin of the valves parallel to it, arca narrow; the sides of the valves are ornamented with densely arranged radiating little ribs, these are rather unequal in size, but radiate in every direction, and are indented by fine closely arranged concentric striations.

The example of this species figured in the 'Mineral Conchology,' represents the immature stage of growth in which the concentric striations are scarcely distinguishable, and the general form has not acquired the full degree of convexity. In the description of *Arca pulchra*, Mr. Sowerby states that it is "nearly twice as wide as long; the striæ are very uniform and close together; the valves are rather flat in the middle;" and further remarks—"Although there is hardly any appearance of a sinus in the margin, this is placed as an *Arca* because it has no transverse elongated teeth in the hinge, those nearest the extremities being longitudinal; it is, however, one of the links that unite the two genera."

*Localities.* The shelly beds of the Great Oolite throughout the Minchinhampton district; Ancliff, Wilts; Ponton, Lincolnshire.

ARCA KILVERTI. Tab. V, fig. 10.

*Testá oblongá aut subrhomboidali, umbonibus medianis contiguís; lateribus compressis; basi arcuatá; superficie bipartitá sulco lato; costulis radiantibus (circa 50) subnodosis, lineis concentricis crebris decussatis.*

Shell oblong or subrhomboidal, umbones moderately large, mesial, and contiguous; the sides of the shell compressed, the lower margin curved; the surface divided into two parts by a wide superficial sulcation; radiating lines or costæ (about 50) slightly nodose, and decussated by fine, closely arranged concentric lines.

Upon the sides of the shell the costæ are more widely separated, and the interstitial spaces sometimes disclose a smaller rib. It ranks as one of the more rare Great Oolite forms, the figure nearly agrees with *Arca bipartita*, Roemer, 'Nordd. Ool.,' tab. 14, fig. 12; but that species is destitute of the concentric lines.

Height, 3 lines; length, 6 lines.

*Locality.* Minchinhampton Common.

Named in compliment to Mr. Kilvert, of Bath.

ARCA TENUITEXTA. Tab. V, fig. 9.

*Testá parvá, ovato-oblongá, umbonibus obliquis antemedianis subdistantibus; marginibus rotundatis; dorso convexo, superficie mediano sulco lato impressá; lineis radiantibus crebris minutis aliis concentricis decussatis.*

Shell small, ovately oblong, umbones oblique, anterior to the middle of the valves, and separate; hinge margin of moderate length, its extremities rounded, base slightly sinuated by a wide but superficial sulcation which descends from the umbo; the entire surface is covered with radiating, closely arranged, depressed, very fine lines, crossed by others concentric and closely arranged.

The general figure has a considerable degree of convexity, and the hinge margin is very short; the radiating and concentric interstitial spaces are so minute that they resemble fine punctuations. It ranks as one of the smallest and most rare of the Great Oolite *Arcacea*; it is found in the planking and contemporaneous white stone of Bussage.

*Localities.* Minchinhampton and Bisley Commons.

ARCA PRATTII. Tab. V, fig. 3.

*Testá subrhomboideá, umbonibus antemedianis contiguís, areá angustatá; latere antico margine rotundo, latere postico producto, angulo obliquo declivi; costulis radiantibus*

*tenuissimis crebris, costulis posticis majoribus subnodosis; lineis incrementi paucis distantibus.*

Shell subrhomboidal, umbones compressed, placed anterior to the middle of the valves, and contiguous; area narrow; anterior portion with the margin rounded, posterior side more lengthened, with an angle passing obliquely from the umbones to the infero-posterior extremity; radiating costæ very fine and closely arranged, the costæ posterior to the angle are larger and nodose; lines of growth few and distant.

The usual figure is compressed, and the posterior angle is acute, but there is much variation in the convexity of the valves. The *Arca funiculosa*, Goldfuss, tab. 121, fig. 13, has a general resemblance to it, but differs in having regular distinct concentric lines.

It is the most common *Arca* in the Great Oolite, and occurs throughout all the shelly beds.

Height, 8 lines; length, 15 lines; diameter through both the valves, 6 lines.

*Localities.* Minchinhampton, in the Great Oolite; Ancliff, Wiltshire. Leckhampton Hill near Cheltenham, in the shelly free stone of the Inferior Oolite; also in the Oolite of Ponton, Lincolnshire.

This species is dedicated to S. P. Pratt, Esq., F.R.S.

#### ARCA EUDESII. Tab. V, fig. 6, 6 a.

*Testá oblongá, subcompressá; umbonibus obliquis, acutis, antemedianis distantibus, arcá latá; latere antico margine rotundo; latere postico producto carinato longitudinaliter plicato, plicis 3 latis profundis; dorso costulis radiantibus crebris inæqualibus nodosis; striis concentricis frequenter obsoletis; basi rectá.*

Shell oblong, rather compressed, umbones oblique, acute, anterior to the middle of the valves, and distant; area large; anterior side with the margin rounded, posterior side with an obtuse carina more produced, and having upon the surface posterior to the carina three large strongly-marked longitudinal plications; the dorsal surface has very fine radiating costæ densely arranged, knotted, and unequal; concentric striæ very faintly traced; inferior margin straight.

The less convex form will distinguish it from *Arca trisulcata*, Goldfuss, the figure is nearly that of his *Arca fracta*, but that shell is destitute of the posterior longitudinal plications, it is scarcely so wide as *Arca lata*, Dunker, and more compressed upon the dorsal surface; that species would likewise seem to want the large posterior folds. It occurs very rarely in the shelly beds of the Great Oolite.

Height, 7 lines; length 14 lines; diameter through both the valves, 7 lines.

*Localities.* Minchinhampton Common; Langrune, Normandy.

This species is dedicated to Professor Eudes Deslongchamps, of Caen, who has obligingly forwarded to us, for comparison, many interesting shells from the Great Oolite of Normandy.

ARCA ÆMULA, *Phil.* Tab. V, fig. 17.

ARCA ÆMULA, *Phil.* Geol. Yorksh., i, t. 3, f. 29, 1835.

*Testá subrhomboideá, vel oblongá, inæquilaterali, convexá, umbonibus obliquis antemedianis distantibus; latere antico convexo, latere postico elongato, obtusi carinato et compresso; superficie sulco lato mediano; basi subrectá; lineis radiantibus crebris minutis nodosis, plicis concentricis paucis interruptis: superficie posticá excavatá, plico unico obliquo mediano et sulcis duobus conformibus parallelis.*

Shell subrhomboidal or oblong, inequilateral, convex, umbones oblique, placed anterior to the middle of the valves and separated by a moderately wide area; anterior side convex, posterior side elongated, obtusely carinated and compressed; the dorsal surface with a wide and slightly oblique depression which is not always distinct; basal margin straight; radiating lines closely arranged, fine, minute, and knotted, interrupted by a few concentric plications; the surface posterior to the obtuse carina is concave, has a mesial oblique plication which is bounded upon each side by a sulcation.

The greater number of examples have not preserved the lines which ornament the surface, but the posterior plications are always distinctly shown. In the Great Oolite of Minchinhampton, the species occurs in a dwarfed or rather in an immature form, which would scarcely be identified, but for the aid of specimens from other localities; it occurs well preserved in the shelly roe stone of Leckhampton Hill, and likewise in the Ponton Oolite, at both of which places it attains its full dimensions.

*Localities.* Minchinhampton and Bisley Commons. Ponton, Lincolnshire.

ARCA ÆMULA, *Phil.* var. TRANSVERSA. Tab. V, fig. 8.

A shell which we consider to be only a variety of *A. æmula* requires a separate notice, it is more elongated and subcylindrical, the mesial or oblique depression upon the dorsal surface is usually distinctly marked, and the shell never acquires the dimensions of the typical form, the length of the largest specimens not exceeding 10 lines.

The more mesial position of the umbones will serve to distinguish this shell from young examples of *Macrodon Hirsonensis*, to which in other respects it has a considerable resemblance; it is more elongated and cylindrical than any other of the contemporaneous *Arcacea*.

It occurs not uncommonly throughout the shelly beds of the Great Oolite, but the delicate features of its surface are seldom well preserved.

*Localities.* Minchinhampton and Bisley Commons.

ARCA RUGOSA? var. of ARCA PRATTII. Tab. V, fig. 2.

*Testá subrhomboideá, convexá, anticè rotundá, posticè compressá, angulo obliquo acuto; umbonibus depressis approximatis, antemedianis lineis radiantibus crebris undulatis subnodosis et imbricatis; plicis concentricis rugis, irregularibus subundulatis; basi subsinuatá.*

Shell subrhomboidal, convex, anterior side rounded, posterior side much compressed,

with an oblique sloping acute angle; umbones depressed, approximate, placed anterior to the middle of the valves, radiating costæ closely arranged undulated, slightly nodulated and imbricated; concentric folds numerous, rugose irregular and somewhat undulated; base sinuated.

This species is exceedingly irregular both in its general figure and convexity, the portion of the shell posterior to the carina is excavated and compressed, the lines upon its surface are much knotted; *Arca Prattii* approximates to it but is less convex, and in that species the lines are not nodose, neither has it the concentric undulating plications and sinuous base which distinguishes the *Arca rugosa*. It occurs somewhat rarely in the shelly beds of the Great Oolite.

*Localities.* Minchinhampton and Bisley Commons.

ARCA MINUTA, Sow. Tab. V, fig. 11 a; Tab. VI, fig. 19.

CUCULLÆA MINUTA, Sow. Min. Con., t. 447, f. 3, 1824.

*Testá parvâ trapeziformi, convexâ, umbonibus acutis submedianis, subdistantibus, areâ magnâ lævigatâ obliquâ; lateribus striis crebris radiantibus plicis incrementi interruptis.*

Shell small trapeziform, convex, with acute and rather distant umbones, area large, smooth, sloping obliquely, the sides of the valves with densely arranged radiating striations, broken by the concentric plications of growth.

The figure of this little shell varies considerably in the size of the area, and in the general convexity, the posterior angle is strongly marked, rather acute and slightly concave; the striations are only visible under a magnifier; from two to ten lines appear to be the amount of variation in length. It is not common, and is usually badly preserved, its range is throughout the Great Oolite and Bradford clay of Gloucestershire.

*Localities.* Minchinhampton; Ancliff, Wiltshire; Langrune, Normandy.

#### *Sub-Genus—MACRODON, Lycett.*

MACRODON, H. E. Strickland and J. Buckman. Geol. of Chelt., 1845, p. 98.

*Testâ subrhomboidâ, umbonibus anticis subremotis, areâ cardinali modicè latâ lævigatâ, margine cardinali recto valde elongato; latere antico convexo crasso, latere postico compressiusculo, tenui et subtruncato; margine inferiori corrugato, sinuato et hiante. Cardo linearis, dentibus (5—7), anticis, angustis parallelis et obliquis; dentibus posticis plerumque duobus, angustis, longitudinaliter elongatis ad extremitatem posticam testæ productis. Impressio muscularis, anticus elevatus (ut in Cucullæa instructa,) posticus obsoletus.*

Shell subrhomboidal, umbones anterior, rather distant, cardinal area moderately wide, smooth, hinge line straight, and much elongated; anterior side rounded and thick, posterior side rather compressed, somewhat truncated and thinner, inferior margin corrugated in its middle part, sinuated and gaping. Hinge linear, teeth (5—7), situated anteriorly, narrow, parallel, and oblique; posterior teeth usually two, narrow, elongated longitudinally

extending nearly to the posterior extremity of the hinge line. Of the muscular impressions the anterior one is elevated upon a raised internal projecting ledge, as in *Cucullæa*, the posterior impression is indistinct. The general figure is that of *Byssosarca*, the umbones which are rather small, are placed near to the anterior extremity of a very lengthened hinge line, the corrugation in the ventral border and hiatus are strong points of resemblance to that genus. The dental characters present an approach to those of *Cucullæa*, but in lieu of diverging from the central or subumbonal portion of the hinge line, as in that genus, they are all turned in one direction inclining posteriorly. Another external feature should be noticed, which it possesses in common with some other of the *Arcacea*, viz.: there is a depression upon the back of the shell, extending obliquely from the umbo to the middle of the lower border. In generic value, this form will take rank with *Cucullæa* and *Byssosarca*, but whether the two latter should be regarded, of generic or only of subgeneric value, as considered by some authors, is a subject which we will not discuss; Palæontologists, however, will perceive the convenience of separating the present form from others of the *Arcacea*.

MACRODON HIRSONENSIS, *D'Archiac*, Sp. Tab. V, fig. 1, 1a, b, c.

CUCULLÆA ELONGATA. Phil. Geol. York., i, t. 11, f. 43, 1835.

— — Goldfuss. Pet., t. 123, f. 9, 1840.

— HIRSONENSIS, *D'Archiac*. Mém. Soc. Géol. Fr., t. v, t. 27, f. 5, 1843.

*Testá in ætate juniore costatá, costis radiantibus, regularibus, et imbricatis, ætate progrediente costis plerumque obsoletis, cum laminis incrementi magnis, paucis et rugis.*

Shell in the young state costated; costæ radiating, elevated, regular and imbricated; with increase of growth the costæ gradually disappeared, and the surface was rendered rugose by large folds or laminæ of growth, which are usually few and distant; they become corrugated near to the hiatus in the lower border, as in *Byssosarca*.

The aspect of this shell changed so much during the progress of growth, that without a regular series for comparison, the larger and smaller specimens would probably be separated into distinct species; the figure given in the 'Geology of Yorkshire,' Pt. 1, t. 11, fig. 43, accurately represents the shell in its young state; the costæ are then sharply defined, perfectly regular, and it has not acquired the laminæ of growth which subsequently disarranged the regularity and continuity of the costæ; the figure of Goldfuss, t. 12, fig. 9, is rather more elongated than is usual, it is of middle size, and the costæ are still visible; the figure of *D'Archiac*, t. 27, fig. 5, though beneath the middle size, represents the stage of more advanced growth, in which the costæ are obliterated, and the lower border becomes corrugated. Sometimes, however, traces of the costæ are visible even upon shells of the largest size, and on the other hand, small shells may be found smooth. The cast figured under the name of *Macrodon rugosus*, by Professor Buckman, in the 'Geology of Cheltenham,' plate 5, fig. 5, appears to represent another species which has a few distant and strongly-marked radiating costæ.

*Localities.* It occurs abundantly in the Minchinhampton district, but is chiefly found in the planking of Minchinhampton Common; it occurs likewise more rarely in the Inferior Oolite of the same district. Ponton, Lincolnshire.

Height of the largest example,  $2\frac{1}{2}$  inches; length of the hinge line, 5 inches.

*Sub-Genus*—CUCULLEA, Lam., 1801.

*Gen. Char.* Shell inequilateral ventricose; umbones large, distant, separated by a ligamental area. The posterior surface with an oblique angle more or less prominent; the margins of the valves close all round. Hinge linear straight, teeth radiating obliquely from beneath the umbones. Muscular impressions two, of which the anterior one is supported by an elevated plate or ledge, projecting from the side of the shell; the posterior impression is rounded and faintly marked.

CUCULLEA CONCINNA, *Phil.* Tab. V, fig. 7.

CUCULLEA CONCINNA, *Goldfuss.* Petref., t. 123, f. 6? 1840.

— — *Phil.* Geol. York., i, t. 5, f. 9, 1835.

? CUCULLEA SUBLEVIGATA, *Zieten.* Wurt., p. 75, t. 56, f. 3, 1834.

*Testá ovato-rhomboidéá, convexá, umbonibus antemedianis magnis depressis approximatis; latere antico brevi margine rotundo; latere postico acute-carinato obliquo declivi; superficie striis concentricis regularibus crebris; lateribus costis radiantibus paucis et prominentibus.*

Shell ovately rhomboidal, convex, umbones anterior to the middle of the valves, large, depressed, and nearly touching each other; anterior side short, its margin rounded; posterior side with an acute carina sloping obliquely; the surface has closely arranged, regular and very fine concentric striations; the sides of the shell have a few radiating prominent costæ, those upon the anterior side are four, elevated and distant.

Our specimens agree with the figure of Phillips, but differ somewhat from that of Goldfuss, which has fine radiating lines; it is probable, therefore, that the latter is a distinct species.

It occurs not uncommonly in the shelly beds of the Great Oolite.

*Localities.* Minchinhampton and Bisley Commons.

CUCULLEA GOLDFUSSI, *Roemer.* Tab. V, fig. 4, 4a.

CUCULLEA GOLDFUSSI, *Roemer,* 1836. Nordd. Ool., p. 104, t. 6, f. 18.

*Testá trapeziformi convexá, concentricè subrugosá, anticè rotundatá, angustatá, posterius angulo rotundo cordato-compressá margine postico oblique truncato; umbonibus crassis prominulis incurvis, areá lanceolatá 5—6 striatá. (Roemer).*

Shell trapeziform convex, the surface with irregular concentric rugose plications, anterior side short, convex, its margin rounded, posterior side with an oblique obtuse angle, the side posterior to the angle compressed and truncated; umbones large, incurved, and almost touching each other; area lanceolate, of moderate size, with 5 or 6 striæ.

This species has some resemblance to *Cucullæa oblonga*, Phillips, but it is less elongated, the umbones are more compressed, and it is destitute of all radiating lines; the more oblique form, compressed umbones, and longer posterior side, will distinguish it from *Cucullæa cucullata*, when the surface markings of that species are not distinguishable.

Height, 16 lines; length, 21 lines; diameter through both the valves, 14 lines.

*Localities.* Minchinhampton and Bisley Commons, where it occurs in all the shelly beds.

CUCULLÆA CUCULLATA, *Goldfuss*. Tab. V, fig. 5.

CUCULLÆA CUCULLATA, *Goldfuss*. Petref., p. 148, t. 123, f. 7, 1840.

*Testâ ovato-rhomboideâ, ventricosâ, umbonibus antemedianis approximatis, latere postico compresso-declivi, concavo, carinato lævi; lineis concentricis confertis et radiantibus subtilissimis.* (*Goldfuss*.)

Shell ovately rhomboidal, ventricose, umbones placed anterior to the middle of the shell, oblique, and somewhat separated; posterior side with an oblique obtuse carina, posterior to which is a flattened or slightly concave surface; the inferior margin is curved; the lines both radiating and concentric are closely arranged, very fine, but irregular and unequal, the part posterior to the carina or angle being destitute of lines; the plications of growth are faintly marked, few, and distant.

The finely reticulated surface is usually most distinct in young specimens, those of more advanced growth being nearly smooth. It occurs throughout the shelly beds of the Great Oolite, but is not abundant. It likewise occurs in the middle division of the Inferior Oolite at Leckhampton, and near to Nailsworth in Gloucestershire.

*Locality.* Minchinhampton Common.

NUCULA, *Lam.*, 1801.

*Gen. Char.* Shell transverse, inequilateral, ovately oblong; hinge linear, separated in the middle by a fossa or oblique channel; teeth numerous, elevated, narrow, or frequently comb-like; umbones contiguous, curved posteriorly; ligament partly internal, inserted in the central fossa or canal.

NUCULA VARIABILIS, *Sow.* Tab. V, fig. 13, 13a.

NUCULA VARIABILIS, *Sow.* Min. Con., t. 475, f. 2, 1824.

— — Phil. Geol. York., vol. i, t. 9, f. 11, 1835.

NUCULA SUBGLOBOSA, *Roemer*. Verst. Oolith., t. 6, f. 7, 1836.

*Testá parvá, læviusculá, ovatá, convexá, obliquá, umbonibus anticis, latere antico brevissimo, latere postico, oblique declivi, basi ellipticá curvatá, lineis concentricis irregularibus tenuissimis.*

Shell small, smooth, ovate, convex, oblique, umbones anterior, anterior side very short, posterior side lengthened, its border obliquely sloping, base curved elliptically, lines concentric, irregular, and very fine.

This small shell is common throughout the shelly beds of the Minchinhampton district, where its figure is much less variable than in the specimens from Ancliff, which are figured in the 'Mineral Conchology,' so that it is not easily mistaken for any other contemporaneous species.

*Localities.* Ancliff and Minchinhampton.

NUCULA WALTONI, Tab. V, fig. 14.

*Testá parvá ovatá subcompressá, umbonibus acuminatis, anticis, latere antico rotundo, postico elongato et subrostrato.*

Shell small, ovate, rather compressed, umbones acute and anterior; anterior side short and rounded, posterior side elongated and somewhat rostrated.

The figure has some resemblance to *N. acuminata*, but the anterior side is much more produced, the posterior extremity more pointed; there is a kind of obtuse ridge, extending posteriorly from the umbo to the inferior and posterior extremity, and the junctions of the valves posteriorly are compressed, and the surface is very smooth. It is very common in the Clays of the Fullers-earth and likewise in the Bradford Clay, having the valves in apposition; in the shelly beds of the Great Oolite it occurs very rarely, and the valves are disunited.

*Localities.* The Cotswold Hills, at various localities in the Fullers-earth; the Tetbury Road Railway Station, in the Bradford Clay; Minchinhampton Common, in the Great Oolite.

This species is dedicated to that indefatigable collector, Mr. Walton of Bath.

LEDA, *Schumacher*, 1817.

NUCULA (pars), *Lam.*

LEMBULUS, *Risso*, 1826.

DACROMYA, *Agass.*, 1840.

*Gen. Char.* Shell inequilateral, umbones small, contiguous, anterior side convex, its margin rounded; posterior side attenuated, posterior slope lengthened, and excavated; teeth numerous parallel, separated in the middle by a fossa, structure of the test fibro-lamellar.

LEDA MUCRONATA, *Sow.*, Sp. Tab. VI, fig. 7.

NUCULA MUCRONATA, *Sow.* Min. Con., t. 476, f. 4, 1824.

*Testá parvâ subrhomboidali, rotundatâ, convexâ concentricè sulcatâ, posticè mucronatâ.*

Shell subrhomboidal, rounded, convex, concentrically sulcated, posteriorly mucronated.

Two thirds as long as wide, very minute; the posterior side is drawn out in the form of a flattened spine, and is distinguished from the other portion of the shell by being flatter. (Sowerby.)

The figure of this shell is copied from the one given in the 'Mineral Conchology.'

*Locality.* Ancliff, Wiltshire.

LEDA LACHRYMA, *Sow.*, Sp. Tab. V, fig. 15, 15a.

NUCULA LACHRYMA, *Sow.* Min. Con., t. 476, f. 3, 1824.

— — Phil. Geol. York., i, t. 11, f. 14, 1835.

— — *Goldfuss.* Petref., t. 125, f. 10, 1840.

NUCULA CAUDATA, *Köch and Dunker.* Beit. Nord. Ool., p. 31, t. 2, f. 7, 1837.

? LEDA ACASTA, *D'Orb.* Prodrom. Paléont., i, p. 275, 1850.

*Testá ovato-subtriquetrâ ventricosâ, anticè inflatâ, posticè elongatâ attenuatâ, umbonibus antemedianis, lunulâ declivi ellipticâ, marginatâ, angulo cardinali obtuso; lateribus striis concentricis remotiusculis interdum obsoletis.*

Shell ovately subtriquetral, ventricose, anterior side inflated, posterior side lengthened and attenuated, umbones anterior to the middle of the shell, lunule elliptical, sloping obliquely and marginated, the cardinal angle obtuse; the sides of the shell with regular concentric striations, rather remote, and faintly impressed, sometimes undistinguishable.

The few specimens which have been obtained agree with the figure in the 'Mineral Conchology,' rather than with that of Goldfuss, which is more produced posteriorly; the apparent absence of striations in the specimen figured by Sowerby has induced D'Orbigny to regard the striated figure of Goldfuss as distinct, but whoever has examined the half-obliterated striations of the Great Oolite specimens will be convinced of the fallacy of such a distinction. The figure 15a represents the smooth variety from Ancliff, which has been kindly lent to us for comparison by Mr. J. D. C. Sowerby.

*Localities.* Minchinhampton and Bisley Commons; Ancliff; it is rare.

LIMOPSIS, *Schacchi*, 1827.

TRIGONOCELIA, *Nyst*, 1834.

PECTUNCULINA, *D'Orbigny*, 1850.

*Gen. Char.* Shell smooth, transverse, ovately oblong or subquadrate, umbones mesial depressed, contiguous; hinge curved, teeth raised, numerous, minute, placed in a parallel series, which is separated in its middle portion by a triangular depression. Ligament

nearly internal, placed in the trigonal fossa beneath the umbones, margins of the valves entire.

The smooth valves, mesial cardinal fossa, subquadrate form, and entire margins distinguish it from *Pectunculus*. The general character of the hinge presents an approximation to *Limea*, Goldfuss, both in the curvature of the series and form of the teeth; the latter genus may in fact be regarded as a representative of *Limopsis* amongst the *Limæ*. In *Nucula* the series of teeth form an angle, they are narrow and raised like a comb.

LIMOPSIS OOLITICUS, *D'Archiac*, Sp. Tab. V, fig. 16, 16a.

PECTUNCULUS OOLITICUS, *D'Archiac*. Mém. Soc. Geol. Fr., t. v, t. 27, f. 6, 1843.

? — OBLONGUS, *Sow.* Min. Con., t. 472, f. 6, 1824.

? — MINIMUS, *Sow.* Ibid., t. 472, f. 5.

*Testá lævigatá oblongá, convexo-planá, subcompressá inæquilateratá, umbonibus prominulis, obliquis, lateribus oblique truncatis.*

Shell smooth, oblong, more or less transverse, convex but somewhat flattened, inæquilateral, umbones prominent, oblique, the sides obliquely truncated, the lower margin lengthened and curved.

This species, which is very abundant, occurs under several varieties of aspect; the hinge line may be nearly straight and angular, or rounded; the figure may differ much in the degree of convexity, and in the length transversely; all the specimens are larger than the Ancliff shells which were figured in the 'Mineral Conchology' under the specific names *P. minimus* and *oblongus*, but which, nevertheless, we are disposed to regard as only varieties of the present species, and to these we might add another variety, which together with a short superior or hinge border, has several irregular folds upon the surface, giving it a rugose aspect. Owing to the great abundance of the species, we are at any time enabled to compare these varying forms, the test being thick, always well preserved, and never compressed. It occurs indifferently in all the shelly beds, and is one of the most common shells of the formation.

The *Limopsis Dammariensis* of Buvignier, 'Geol. de la Meuse,' p. 20, pl. 16, f. 26—29, has some resemblance to our species, but has greater convexity and less angularity of figure.

*Localities.* The entire formation in the Minchinhampton district; Ancliff, Wiltshire. Eparcy, Langrune, France.

#### TRIGONIA, *Bruguère*, 1791.

TRIGONIA, *Lam.*, 1804. *Park*, 1811. *Sow.*, 1815. *D'Orbigny*, 1850.

HIPPOCEPHALOIDES (NUCLEUS), *Plot.*, 1676.

LYRIODON, *Bronn*, 1836. LYRODON, *Goldfuss*, 1838.

*Gen. Char.* Subtrigonal, rounded anteriorly, truncated posteriorly with an oblique

flattened, or excavated area, which extends posteriorly from the umbo to the infero-posterior extremity, and is separated from the dorsal surface by a ridge or angle, and by a similar division from a small lanceolate space upon the other side, the anterior part of which supports the ligament; umbones recurved, contiguous, usually angulated; the dorsal surface is ornamented with longitudinal or concentric rows of costæ or tubercles. The hinge has four oblong compressed diverging teeth in one valve, the sides of which are grooved transversely, and two similar teeth in the other valve; ligament external, muscular impressions two in each valve, elliptical, and deeply impressed.

In the descriptions of species, we use the term *marginal carina* to indicate the ridge which bounds the area from the other surface of the shell; *inner carina*, the ridge which separates the area from the lanceolate space; the *median carina* is a ridge or line of tubercles which passes longitudinally along the middle of the area.

TRIGONIA SUBGLOBOSA. Tab. V, fig. 21.

*Testâ suborbiculari, convexâ, umbonibus prominulis recurvatis; margine anteriore et inferiore rotundato, margine posteriore brevi et concavo; areâ brevi, latâ transversè striatâ, carinis tribus ornatis, carinis tuberculosi, carina marginali tuberculis majoribus; costis numerosis per series angulatis dispositis, posticè magnis et tuberculatis, anticè lævigatis crebris interdum obsoletis.*

Shell subglobose, umbones prominent and recurved, the anterior and inferior margins rounded, the posterior margin short and somewhat concave; area short and wide, striated transversely, and ornamented with three tuberculated carinæ, of which the marginal carina has the larger tubercles; the space between the inner carinæ is smooth and short; the other portion of the shell has numerous closely-arranged oblique tuberculated costæ which form a series of angles upon the middle of the shell, the angles being usually greater than right angles. The anterior portions of the costæ pass obliquely downwards to meet the posterior portions, they are smooth, usually undivided, and towards the lower part of the shell become nearly obsolete; their posterior portions are large, forming irregular varices, which are very prominent. It is nearly allied to *Trigonia Goldfussii* in the character of its surface, the chief distinction consisting in the fewer costæ and less acute angle of the latter species; but the figure of the two species is very different. *T. Goldfussii* is much more flattened and less elongated posteriorly, the umbones are not recurved, the figure of the area altogether is more lengthened and straight, and it likewise attains to a larger size than *T. subglobosa*.

Our species occurs rarely both in the shelly beds of the Great Oolite and in the upper part of the middle division in the Inferior Oolite.

*Localities.* Minchinhampton Common, in the Great Oolite; Nailsworth, or Scar Hill, in the Inferior Oolite.

TRIGONIA GOLDFUSSII, *Agass.* Tab. V, fig. 18, 18a.

LYRODON LITTERATUM, *Goldfuss.* Petref., t. 136, f. 5, 1840.

TRIGONIA GOLDFUSSI, *Agaz.* Mém. sur les Trigonees, p. 35.

? — CUSPIDATA, *Sow.* Min. Con., t. 507, f. 4, 5, (junior.)

*Testá plano-convexá, ovato-trigoná, anticè et infernè rotundatá, posticè truncatá; tuberculis per series undulatas dispositis, ad carinam marginalem crassissimis; carinâ marginali tuberculis ornatá; areâ cardinali transversim striatá; tuberculis nonnullis in carinâ internâ.* (Agassiz, pro parte.)

Shell with a moderate convexity, ovately trigonal, the anterior and inferior borders rounded, the posterior border truncated; umbones not prominent, nearly straight, costæ few, tuberculated, disposed in a series of rows which anteriorly are slightly curved, passing obliquely downwards, posteriorly the costæ are larger, and are curved upwards at a considerable angle; the area is flattened, transversely striated in the young state, but nearly smooth in the adult; the inner carina is slightly tuberculated, and the tubercles upon the marginal carina are more distinct.

The series of costæ posteriorly, which at first are tuberculated and moderately curved, afterwards gradually become large, irregular compressed varices, which are directed nearly perpendicularly downwards, and form a considerable angle at their junction with the posterior portions of the costæ. The inner carina is small and indistinctly tuberculated; the marginal carina is much larger, but has likewise indistinct tubercles, which disappear altogether in the adult state of growth; the area is divided into two parts by a slight longitudinal furrow.

The examples of this species are moderately numerous and of every stage of growth, so that ample materials are afforded for comparison. The surface markings underwent a continuous change throughout the life of the *Mollusk*; in the earliest condition, when the length is only 6 or 7 lines, the surface has a few regular curved and smooth costæ, which form an angle or prominence as they pass over the marginal border (or position of the carina), to the area which they cross, forming so many large plications; when about seven costæ have been perfected, those which succeed begin to have their posterior extremities more curved and indented to form tubercles, the plications upon the area have then degenerated into striations; ultimately these latter become indistinct, and the portion of the area last formed is nearly smooth; the posterior extremities of the costæ gradually become large varices, which are directed nearly perpendicularly downwards, and are imperfectly united to the anterior portions. The minute shell from Ancliff, figured in the 'Mineral Conchology' under the name of *Trigonia cuspidata*, Sow., is probably the present species in its earliest stage of growth.

It will also be perceived, that the young shell very nearly resembles the same stage of *Trigonia Moretoni* the only distinction residing in the more prominent costæ of *T. Goldfussii*. The Great Oolite shells never attain to the magnitude of those figured by

Goldfuss, and the small example figured by him, tab. 136, fig. 5*a*, appears to be another species altogether unlike the young examples of our shell. *Trigonia litterata* of Phillips, 'Geol. Yorksh.,' i, tab. xiv, fig. 11, from the *Lias* of Robin Hood's Bay, is likewise a distinct species, and having the priority, that specific name must be retained for it. *Trigonia Goldfussii*, and more especially young specimens, occur not unfrequently in the coarse bed of planking forming part of the shelly beds of the formation. *Trigonia undulata* from Fromberg, of which M. Agassiz has given two very different figures, would appear to be nearly allied to our species, more especially the shell figured by him, (Etudes Mol. Trigonées, tab. vi, fig. 1,) which exhibits small tubercles upon the carinæ.

*Locality.* Minchinhampton Common.

TRIGONIA MORETONI. Tab. V, fig. 19, 19*a*.

? TRIGONIA CONJUGENS, Phillips. Geol. Yorkshire, i, p. 122.

*Testâ ovato-trigonâ, plano-convexâ, umbonibus obtusis recurvis, arcâ angustâ, transversim plicatâ; plicis magnis irregularibus; carinâ marginali et internâ depressis irregulariter subnodulosis; costis per series numerosis (ætate juniori arcuatis, adulto subangulatis,) et tuberculatis, tuberculis posticis magnis crebris confusè dispositis.*

Shell ovately trigonal, rather depressed, umbones obtuse, recurved, anterior border rounded, posterior border lengthened and slightly excavated; area narrow, transversely plicated, plications large and irregular; marginal and inner carinæ depressed, rather obscure, (more especially in adult specimens,) irregularly undulated; costæ disposed in a numerous series (about 16), which in the young state are regularly curved, but subsequently become somewhat angulated; they are tuberculated, the posterior tubercles being the larger, closely arranged and much confused or irregular.

In the earliest stage of growth the aspect is so dissimilar that it requires a separate notice, the shell is rather compressed, the costæ are prominent, regular, and smooth, the plications upon the area appearing like continuations of the costæ, which they nearly equal in size, and the oblique divisional line upon the area which replaces the median carina is perceptible.

It is only when five or six costæ have been perfected, that they become indented, the indentations becoming more strongly marked with succeeding costæ, and at length forming distinctly rounded tubercles; during a series of five or upwards, the tuberculated costæ continue to have a regular graceful curvature, but subsequently they become irregular and confluent; posteriorly the tubercles are large, and the costæ are at that part usually bent upwards at a considerable angle. Thus in the adult stage of growth, the surface is always irregular and varies in every individual, even more than is usual in the tuberculated *Trigoniæ*. It would seem to be more nearly allied to *T. impressa* than to any other British species, but it is twice or thrice as large, has greater convexity, the apex is more obtuse, the area has much larger and more distantly arranged plications, neither has

it the distinct and regularly tuberculated marginal carina of that species; the arrangement of the rows of costæ is similar, but the tubercles are larger, and the adult condition more confusedly disposed in our shell.

It occurs in the shelly beds of the Great Oolite, in which small specimens are abundant, but adult forms are comparatively rare. The species is respectfully dedicated to Lord Moreton, who has assiduously cultivated geological science.

*Localities.* The Minchinhampton district in general. Stonesfield slate, Oxfordshire.

TRIGONIA COSTATA, *Sow.*, *Var. PULLUS.* Tab. V, fig. 22, 22a.

CURVIROSTRA NON RUGOSA, *Luid.* Lithoph. Brit., t. 9, No. 714, 1760.

DONACITES COSTATUS, *Schoth.* Petref., i, p. 193, 1820.

LYRIODON COSTATUM, *Bronn.* Leth. Geog., t. 20, f. 4, 1836, 1851.

LYRODON COSTATUM, *Goldf.* Petref., ii, t. 137, f. 3, 1840.

TRIGONIA PULLUS, *Sow.* Min. Conch., t. 508, 1826.

— COSTATA, *Lamarck.* An. s. Vert., vi, p. 64, 1819.

— — *Parkinson.* Org. Rem., iii, t. 12, f. 4, 1811.

— — *Zeiten.* Wurt., p. 78, t. 58, f. 5, 1834.

— — *Roemer.* Oolith., p. 97, 1835.

— — *Agassiz.* Mém. sur les Trigonées, p. 35, t. 3, f. 12—14, 1840.

*Testá subtrigóná, umbonibus prominentibus recurvis, acutis, areá magná, plicata et carinatá.*

*In ætate juniori, cariná marginali acutá et lævigatá, cariná mediá et interná denticulatá.*

*Ætate adultæ areá in valvâ sinistrâ cariná marginali magná rotundatá et indentatá; cariná mediá et interná distinctá et denticulatá sed parvâ; superficie inter carinis plicis longitudinalibus densis interdum spinis acutis instructis; areá in valvâ alterâ sine carinâ mediâ plicisque longitudinalibus magnis, paucis interitisque latis et profundis. Costis dorsalibus magnis, lævigatis, elevatis et curvatis, cariná marginali separatis.*

Shell subtrigonal, umbones prominent, acute, recurved; area large, longitudinally plicated and carinated, dorsal surface costated. In the young state, the marginal carina is acute and smooth, the inner and mesial carinæ are denticulated. In a more advanced stage of growth, the area in the left valve has a marginal carina large, rounded, and deeply indented, the median and inner carinæ are distinct and denticulated, the spaces between the carinæ have numerous longitudinal plications, which are not unfrequently covered with asperities, or acute spinous elevations. In the right valve, the surface of the area is different; it is divided into two portions, the posterior portion being more depressed than the other, there is no distinct median carina, but the anterior portion of the area has two large indented plications, separated by wide interstitial spaces, ultimately two other plications are added. The longitudinal costæ are large, smooth, and gracefully curved, separated from the marginal carina by a smooth sulcus; the lanceolate space between the inner carinæ has a surface very similar to that of the area. Notwithstanding the frequency

with which this species has been figured and described, the foregoing definition will be found to differ from all which have previously been given; it is founded, however, upon observation of the form in its varieties and stages of growth without stint of examples. It is distinguished from other allied costated species, by characters which are chiefly supplied by the posterior slope, and which are constant and of importance. When from six to eight costæ have been perfected, the marginal carina acquires large denticulations, and subsequently continues to be indented transversely. The distinctly elevated median carina and finely reticulated surface of the left valve are very different from the corresponding parts of the right valve, the area of which has in its middle a longitudinal divisional line which separates the surface into two portions, the posterior portion being more depressed than the other; at first, there appears a kind of median carina, which subsequently is not to be distinguished from the other plications; these large plications do not occupy the entire surface of the area, but have between them, and more especially separating them from the marginal carina, wide and depressed interstitial spaces. Goldfuss states, that the apex of the right valve is more recurved, or advances before the other; this feature has occasionally been observed in specimens from the Cotswolds, it may therefore be regarded not as an accidental but as an occasional feature, which certainly is absent in the majority of specimens. Neither is this character altogether peculiar to the present species of *Trigonia*. A rigid comparison of specimens proves that the minute *Trigonia pullus* of the 'Mineral Conchology' from Ancliff, is only the germ of *Trigonia costata*, not of the typical large Inferior Oolite shell, but of a much smaller variety, which is abundant in the Great Oolite; adult specimens of this variety, which may be called *pullus*, have an equal number of costæ with the typical form, but the figure is less convex; the anterior border is not truncated, both that and the inferior border being regularly rounded. The linear dimensions never attain to half of the large Inferior Oolite form, an inconsiderable number only exceed an inch in length, but specimens of half an inch, or even less, are much more abundant. The peculiar features of the cardinal area above described are persistent in all the varieties of the species, and furnish a ready means of distinguishing it from allied costated forms, such as *Trigonia similis* of Bronn, *T. Meriani*, *monilifera*, *denticulata*, *papillata*, and *suprajurensis* of Agassiz; *T. costata* of Pusch, 'Polens Palæont.,' taf. vii, figs. 1, 2, is regarded by Agassiz as a distinct species, for which he proposes the specific name of *zonata*. *Trigonia costata* would appear to have very frequently been confounded with an abundant Kimmeridge clay species, but in the latter shell the area is alike in both valves, the marginal carina has not large denticulations, the general form is more elongated, the umbones much less recurved, the marginal carina is nearly straight, and the costæ are much more oblique. In the Minchinhampton district the *pullus* variety of *T. costata* is exceedingly abundant, surpassing in numbers those of the other *Trigonias* combined; the valves are usually disunited, and internal casts are never obtained; a length of 20 lines upon the marginal carina appears to be its utmost limit in size.

*Localities.* Everywhere in the shelly beds of the Minchinhampton district; in the Forest Marble of Wiltshire and Dorsetshire.

TRIGONIA COSTATA, Sow., var. ELONGATA. Tab. V, fig. 23.

Somewhat rarely an elongated variety of this well-known form occurs in the shelly beds of the Great Oolite; it is somewhat more convex than *T. pullus*, the marginal carina is remarkable for its general straightness and prominence, the costæ are less curved and are disposed with greater obliquity than in the other varieties, and the character of the area has nothing peculiar. It is not distinguishable from a shell from Cutch, figured and described by Mr. Sowerby in the 'Geological Transactions,' 2d ser., vol. v, pl. 21.

TRIGONIA FLECTA. Tab. V, fig. 20.

*Testa ovato-trigonâ, subcompressâ, areâ elongatâ, planatâ, transversè striatâ; carinis ejusdem subnullis, superficie costis angustis, horizontalibus rectis, posticè angulo flectis, angulo costarum subrecto.*

Shell ovately trigonal, or oblong, rather compressed, area elongated and flattened, transversely striated; carinæ scarcely distinguishable, the middle portion of the area with a longitudinal furrow; the other portion of the shell with narrow straight nearly horizontal costæ, which at their posterior portions are suddenly bent upwards at a right angle, and become nodose, forming short perpendicular varices.

It differs from *T. angulata*, Sow., in the absence of tuberculated carinæ upon the area, in its flatness and in the costæ, which are more closely arranged, and have not the elegant curvature of the Inferior Oolite shell. The general figure is more oblong than *T. Goldfussii* and *T. undulata*, Agassiz, to both of which it has a certain resemblance in the character of its surface. It would seem to be rare; we have only met with a single example, which occurred in a rock too hard to permit the perfect exposure of the shell; its position is a bed somewhat shelly and situated a little beneath the Bradford clay.

*Locality.* The Tetbury Road station of the Great Western Railway.

TRIGONIA DUPLICATA, Sow. Tab. VI, fig. 2.

TRIGONIA DUPLICATA, Sow. Min. Con., t. 237, f. 4, 1819.

*Testa ovato-trigonâ anticè rotundatâ, posticè productâ et rostratâ, umbonibus obtusis sub-recurvis; areâ angustatâ transversâ striatâ, medio sulco longitudinali, carinis parvis tuberculis minimis instructis; costis serratis ornatis; costulis prioribus concentricis et regularibus, aliis obliquis nonnunquam dichotomis.*

Shell ovately trigonal, moderately convex, anterior extremity rounded, posterior extremity produced and rostrated, superior border rather concave; umbones mesial,

obtuse, slightly recurved; area narrow, transversely striated with a mesial longitudinal furrow; carinæ small, with densely arranged minute tubercles; costæ serrated; the first few costæ are regular and concentric, the others are directed obliquely downwards from the marginal carina to the lower border, they are nearly straight, some few are dichotomous and slightly waved, the serrations are irregular or unequal, which gives to the costæ a knotted aspect.

This species is not uncommon (more especially the external moulds), in the bed called *Trigonia grit*, a member of the upper division of the Inferior Oolite; in the Great Oolite it is very rare.

*Localities.* Minchinhampton Common, in the Great Oolite. The Cotswold hills generally, in the Inferior Oolite.

TRIGONIA IMPRESSA, Sow. Tab. V. fig. 24.

TRIGONIA IMPRESSA, Sow. Zool. Journal, iii, t. 11.

— — Prevost. Ann. Scien. Nat., iv, t. 18, f. 22, 23.

— — Morris. Catal. Brit. Foss., p. 103, 1843.

*Testá ovato—trigoná subcompressá, anticè productá rotundatá, posticè rectá, obliquá; umbonibus submedianis acutis; costis per series numerosis læviter arcuatis, subundulatis et tuberculatis, costis, anticis, obliquis, angustis, subrectis densè serratis, posticis curvatis, tuberculis parvis crebris; areá angustá, transversim striatá, striis tenuibus crebris; cariná marginali nodulis parvis regularibus ornatis, cariná interná transversim plicatá; cariná mediá sulco longitudinali.*

Shell ovately trigonal, rather compressed, anterior side produced and rounded, posterior side straight, oblique, and compressed, umbones nearly mesial acute and very slightly recurved; costæ disposed in a numerous series which are moderately curved, little elevated, somewhat angulated and tuberculated. The anterior portions of the costæ are narrow and but little prominent; they are nearly straight, but are directed obliquely downward, and are more or less distinctly serrated or indented, but do not form distinct tubercles; posteriorly the costæ are more curved or rather angulated; they rise upwards to meet the marginal carina at a right angle and are distinctly tuberculated, the tubercles being small and closely arranged. The area is rather narrow and distinctly bounded by two carinæ; the marginal carina is small, it has regular elevated tubercles which are rather distantly arranged, the inner carina is plicated, an oblique furrow or line replaces the median carina, the surface of the area has at first a few prominent transverse plications, but these soon degenerate into striations which are fine and densely arranged; the lanceolate space between the inner carinæ is elongated and smooth.

The aspect of this little shell is peculiar, and its features are very persistent—few exceed an inch in length, and from this size to half an inch is its most frequent dimensions; they were eminently gregarious, and are numerous scattered over the thin laminæ of

Stonesfield slate, at very many localities, but have not hitherto been discovered in the shelly beds of the Great Oolite.

*Localities.* Stonesfield, Eyeford, and generally throughout Oxfordshire and Gloucestershire, where the Stonesfield slate is present.

TRIGONIA PHILLIPSI. Tab. VI, fig. 1.

*Testá ovato-trigoná, convexá, umbonibus submedianis obtusis, subrectis, areá parvâ planatâ; carinâ marginali angustâ, tuberculis parvis, crebris ornatâ, carinâ internâ varicibus subdistantibus; superficie inter carinis plicis crebris transversis et sulco obliquo mediano instructo; valvis lateribus costis concentricis regularibus crebris elevatis, tuberculis parvis densè dispositis.*

Shell ovately trigonal, convex, anterior border produced and rounded; posterior border truncated, umbones nearly mesial, obtuse, nearly straight and scarcely recurved, marginal carina nearly straight, narrow, and little elevated, ornamented with minute closely arranged tubercles, inner carina with a few prominent rather distantly placed varices; lanceolate space between the inner carinæ wide and smooth; the surface of the area between the carinæ is flattened, traversed transversely by prominent closely arranged plications, and divided in its middle part by an oblique furrow; the sides of the valves have very numerous elevated narrow concentric regular costæ, which are ornamented with small, equal, densely arranged tubercles.

This elegant shell possesses a considerable general resemblance to *Trigonia striata*, Sow.; like that shell the costæ are regular, concentric, elevated, and are furnished upon their upper surfaces with small tubercles; but the figure is essentially different; *T. striata* has the umbones recurved and pointed, the hinge margin posteriorly much excavated, the marginal and inner carinæ have a graceful curvature, and the posterior side of the shell is considerably produced; none of these features are observable in our species, the hinge margin of which is scarcely concave, the umbones obtuse, not prominent and recurved; the posterior side is likewise so short that the umbones appear to be nearly mesial; the costæ in our species are nearly twice as numerous, equally elevated, and the minute tubercles upon them are rounded and much more densely arranged, so that a little distance from the eye the tubercles are scarcely distinguishable. This comparison can only be made between the specimens themselves, for it happens that nearly all the figures hitherto published of *Trigonia striata* are very unsatisfactory, with the exception only of that in the *Petrefacten* of Goldfuss, which is excellent, and represents the adult condition of that species.

*Trigonia Phillipsi* occurs in soft Oolite, in the vicinity of Stamford and Denton, Lincolnshire, and has not been recognised in the Great Oolite of Gloucestershire.

Dedicated to Prof. John Phillips, whose philosophic researches have greatly contributed to the advancement of geological science.

TRIGONIA IMBRICATA, *Sow.* Tab. VI, fig. 8, 8a.

TRIGONIA IMBRICATA, *Sow.* Min. Con., t. 507, f. 2, 3.

Under this name, Mr. Sowerby has figured apparently an immature or young state of a species of *Trigonia* from Ancliff, of which the adult specimens have scarcely been recognised; this small form is shewn in the figure 8a; we believe, however, that the shell represented by fig. 8 belongs to a more advanced stage of growth; the peculiar imbrication of this species noticed by Mr. Sowerby appears to arise from the erosion of the concentric spinose tubercles which ornament the shell.

The young stage of this shell is described in the 'Mineral Conchology,' as being "Transversely oblong, depressed; with five or six concentric, dentated, subimbricated keels upon the rounded anterior side; posterior side obliquely truncated, ribbed. The carinæ upon the surface of this little shell resemble terraces one above the other; each is divided into four or five angular lobes."

*Localities.* Minchinhampton, (fig. 8, in the British Museum Collection;) Ancliff, Wiltshire.

CARDIUM, *Linn.* 1758.

*Gen. Char.* Shell equivale subcordiform, umbones prominent, contiguous. Hinge with two cardinal and two lateral teeth in each valve; the cardinal teeth are approximate, oblique, crucially inserted, one with the other, lateral teeth remote.

CARDIUM SEMICOSTATUM, *Lycett.* Tab VII, fig. 6, 6a, b.

CARDIUM SEMICOSTATUM, *Lycett.* Annals Nat. Hist., 1850.

*Testa parvâ, ovato-orbiculari, convexâ, umbonibus magnis, medianis, concentricè et tenuissimè striatis; latere postico compresso, costulis crebris radiantibus decussatis.*

Shell small, ovately orbicular, convex, umbones large, mesial; concentric striæ regular and faintly impressed; the posterior side is compressed, its concentric striæ are crossed by radiating closely arranged ribs.

The figure of this little species is wide towards the ventral border and narrow towards the umbones, the lunule is small or nearly obsolete; the convexity of the valves is moderate, and the flatness of the posterior side produces at its junction with the dorsal surface a well-defined oblique angle. It would seem to be rare in the shelly beds of the Great Oolite, but the Bradford clay of Wiltshire produces numerous casts of a *Cardium*, which we believe to belong to this species, and which attained a much greater development of growth; casts of this shell are also abundant adjacent to the Tetbury Road Railway station, a locality which is very prolific of the fossils of the Bradford clay.

The height and lateral diameter are about equal, varying from  $2\frac{1}{2}$  to 5 lines.

*Locality.* Minchinhampton Common in the Great Oolite. It occurs likewise in the middle division of the Inferior Oolite of the same district.

## CARDIUM STRICKLANDI. Tab. VII, fig. 5, 5a.

CARDIUM STRIATUM. Geol. Chelt., J. Buckmann and H. E. Strickland, 1845, p. 97.

*Testá suborbiculari æquilaterali, ventricosá, umbonibus medianis, contiguís, marginibus, arcuatis; latere postico lineis radiantibus crebris; dorso lineis concentricis crebris regularibus.*

Shell suborbicular, equilateral, ventricose; umbones, mesial and contiguous, margins of the valves regularly rounded; surface ornamented with concentric regular small ridges, posterior portion with radiating closely arranged lines.

This small species is very abundant in the shelly beds of the Great Oolite, the concentric lines are most elevated and conspicuous in the smallest specimens, in those of the largest size which have a diameter of 10 lines, the lines are nearly or quite obsolete.

Height and lateral diameter equal, diameter through both the valves one third less.

*Localities.* Every Great Oolite quarry in the Minchinhampton district.

## CARDIUM BUCKMANI. Tab. VII, fig. 2.

CARDIUM LEVIGATUM, Lycett. Annals Nat. Hist., p. 422, 1850.

*Testá sublevi orato-suborbiculari convexá, umbonibus medianis prominulis incurvis, latere antico rotundo, postico obliquo, sed rotundo, basi arcuatá; striis concentricis tenuissimis irregularibus.*

Shell smooth, ovately orbicular, convex, umbones mesial, prominent, and incurved, anterior side rounded, posterior side oblique and rounded, base curved symmetrically; dorsal surface, with a few very fine and irregular concentric striæ.

The substance of the test is very thin, and its bad state of preservation together with the variety of the species render it difficult to exemplify it from any one specimen; much finer and more perfect specimens have been procured in the shelly freestone of Leckhampton hill, by the Rev. P. B. Brodie.

Height 22 lines; lateral diameter 24 lines; diameter through both the valves 15 lines. It has occurred in more than one of the shelly beds.

*Locality.* Minchinhampton Common.

## CARDIUM SUBTRIGONUM. Tab. VII, fig. 3.

*Testá subtrigondá, convexá, umbonibus acuminatis contiguís anticis, latere postico elongato oblique declivi, lineis radiantibus undulatis; dorso striis tenuissimis concentricis irregularibus.*

Shell subtrigonal, convex; umbones pointed, prominent, contiguous and anterior; posterior side elongated, sloping obliquely with radiating and waved lines; dorsal surface with very fine, concentric, irregular striæ. An ill-defined obtuse angle passes obliquely

from the umbones to the posterior and inferior angle, and forms a boundary to the radiating posterior lines. The posterior side is not excavated or flattened, as in some other trigonal species, but is rather convex.

It occurs very rarely near to the base of the Great Oolite, in a band of hard whitish argillaceous rock, but has not been found in the shelly beds.

*Locality.* The southern boundary of Minchinhampton Common.

CARDIUM-PES-BOVIS, D'ARCHIAC. Tab. VII, fig. 4, 4a.

CARDIUM PES-BOVIS, *D'Archiac.* Mem. Soc. Geol. Fr., tom. v, t. 27, f. 2, 1843.

*Testá nucleo subtrigóná, convexá; umbonibus magnis incurvis, dorso fornicato, angulo obliquo, acuto carinato; lunulá magná cordatá; latere postico angusto, excavato; dorso lineis longitudinalibus tenuissimis perpendicularibus ornatis.*

Shell with the nucleus subtrigonal and convex; umbones large, incurved, dorsal surface with a ridge forming an oblique and acute angle; lunule large, cordate; posterior side narrow and excavated; dorsal surface with longitudinal, fine, perpendicular lines.

The large excavated lunule, fine perpendicular lines, and more erect mesial umbones, distinguish this from our *C. concinnum*, which latter is a much smaller species. It occurs very rarely in a whitish argillaceous rock near to the base of the Great Oolite.

Height, 30 lines; lateral diameter, 28 lines; diameter through both the valves, 22 lines.

*Locality.* The southern side of Minchinhampton Common.

CARDIUM CONCINNUM. Tab. VII, fig. 7a, b, c.

? CARDIUM MINUTUM, *D'Archiac.* Mem. Soc. Geol. Fr., v, t. 27, f. 4.

? — PES-BOVIS, *junior.*

*Testá ovato-orbiculari, obliquá, umbonibus angulatis incurvis, latere antico rotundo brevi, lunulá parvâ, latere postico compresso aut excavato, angulo obliquo obtuso carinato; dorso costulis radiantibus rotundis crebris, striis concentricis decussatis.*

Shell ovately orbicular, oblique; umbones large, angulated, and curved forwards, anterior side rounded, short; lunule small, moderately excavated; posterior side flattened and excavated, bounded by an oblique and obtuse angled carina; dorsal surface with little ribs radiating, closely arranged, rounded, and decussated by regular, numerous, concentric striae.

The posterior surface is ornamented in a manner similar to the other part of the shell, but so much more faintly marked that, in ordinary or not well preserved specimens, it appears smooth. The general figure has a considerable resemblance to the large *Cardium pes-bovis*, but the latter species is much higher, and more nearly equilateral.

Height, 9 lines; lateral diameter, 10 lines; diameter through both valves, 7 lines.

*Localities.* Minchinhampton Common, Bisley Common.

ISOCARDIA. *Lam.* 1799.

*Gen. Char.* Cordiform, regular, ventricose; umbones prominent, distant, diverging, involute; hinge with two compressed cardinal, and one compressed lateral tooth in each valve; ligament external, bifid, diverging in the direction of the umbones.

ISOCARDIA TENERA, *Sow.* Tab. VII, fig. 1, 1a.

ISOCARDIA TENERA, *Sow.* Min. Con., p. 494, t. 295, f. 2, 1821.

— — *Deshayes.* Traité Élémentaire de Conch., ii, p. 27, t. 24, f. 6, 7.

CEROMYA TENERA, *Agassiz.* Etud. Cat., t. 8—e, f. 1—12, p. 34.

? Var. ISOCARDIA TUMIDA, *Phil.* Geol. Yorksh., i, t. 4, f. 25, 1835.

*Testa nucleo subtrigono, inflato; umbonibus medianis, altis antrorsum incurvis; latere antico lato, striis concentricis subtilissimis.*

Shell with the nucleus subtrigonal, inflated; umbones mesial, elevated, and curved forwards and inwards; anterior side very wide, rather flattened, giving somewhat a three-sided figure to the nucleus; surface of the test with fine concentric striæ.

The convexity of the valves is so considerable that the diameter through both is almost equal to that of the height and length, but the length varies with the stages of growth, the younger forms being more produced laterally and less convex; the posterior side is always rather compressed, and usually exhibits an angle, which passes obliquely from the umbones backwards, but in the more inflated specimens it is obsolete; the valves appear to fit closely at their circumference, and the ventral border is regularly and elliptically curved. The anterior side is very wide, and somewhat flattened, giving a three-sided aspect to the general figure. The nuclei do not display any concentric striæ, and we have never found the test preserved.

*Locality.* It occurs somewhat rarely in the upper beds of the Great Oolite, two miles east of Minchinhampton, but has not been found in the shelly beds of the same formation.

LUCINA, *Brug.* 1791.

*Gen. Char.* Inequilateral, orbicular, posterior side short or truncated, anterior side more produced. Hinge usually with two small cardinal, and two lateral teeth in one valve, one lateral tooth in the other; ligament external, but deeply excavated. Muscular impressions two in each valve, the anterior one narrow and lengthened, the posterior somewhat rounded; impression of the mantle not sinuated.

LUCINA BELLONA, *D'Orb.* Tab. VI, figs. 18, 18 a.

LUCINA LIRATA, var. TRANSVERSA, *D'Archiac.* Mem. Soc. Geol. France, v, t. 26, f. 3.

— BELLONA, *d'Orb.* Prod. Paléont., 1, p. 309.

*Testá transversá, ovato-orbiculari, plano-convexá, anticè rotundatá, posticè subsinuatá, umbonibus medianis acutis, margine cardinali subrecto, oblique declivi, lunulá parvâ excavatá; superficie plicis concentricis magnis irregularibus, striis densissimis impressis.*

Shell transverse, ovate, rather flattened, anterior margin rounded, posterior margin sinuated; umbones mesial and pointed; hinge margin lengthened, straight, and oblique; concentric folds rather irregular, elevated, and impressed with longitudinal, densely arranged, and very fine striations. An obscure elevation passes obliquely from the umbones to the inferior and posterior border. This shell presents considerable variety in its form and markings; young specimens are much more compressed, and their borders are very acute, the general outline is nearly orbicular, and the concentric plications are very distinct and regular: the adult shell becomes either of a suborbicular and convex, or of a transverse and more depressed form, and in both varieties the concentric elevations are placed at unequal distances; the suborbicular variety has a more excavated lunule, and the umbones are more directed forwards or oblique. The shell figured by M. D'Archiac, belongs to the transverse variety to which our Great Oolite specimens belong, but we are not without examples of the other form. It is absent in the shelly beds of the Great Oolite, being found only in mudstones, or a fine calcareous muddy sediment which has become limestone. It occurs very abundantly in the middle division of the Inferior Oolite in Gloucestershire, associated with *Nerinaea*, and a numerous suite of other Mollusks, but is almost absent when the organic *facies* consists of *Terebratulæ*. It reappears in the upper beds of the Great Oolite, forming a numerous colony in a compact marly rock, about one hundred feet above the Fuller's earth, where it is seldom that specimens much better than nuclei can be disengaged.

*Dimensions.* Transverse variety:—lateral diameter, 31 lines; height, 25 lines; diameter through both valves, 13 lines. Suborbicular variety:—lateral diameter, 26 lines; height, 24 lines; diameter through both valves, 13 lines.

*Localities.* In Great Oolite, two miles east of Minchinhampton. In Inferior Oolite, along the outer escarpment of the northern and middle Cotswold hills. Also near Stamford, and in other localities in Lincolnshire.

LUCINA BELLONA, var. *Depressa.* Tab. VI, fig. 15.

*Testá transversá, subæquilaterá, orbiculatá, compressá et lævigatá; margine superiori anticè subhorizontali posticè recto declivi, striis concentris irregularibus.*

Shell transverse, subequilateral, orbicular, compressed and smooth, superior margin anteriorly produced, and nearly horizontal, posterior margin straight and sloping; base regularly elliptical.

The lateral diameter, in regard to the height, is as eleven to nine; the umbones are nearly mesial, and pointed, but depressed; the concentric striæ are very slightly impressed, which gives to the shell a smooth and depressed aspect. It is not very common, but occurs in more than one of the shelly beds of the Great Oolite.

*Localities.* Minchinhampton and Bisley Commons.

LUCINA CRASSA, *Sow. var.* Tab. VI, fig. 13.

LUCINA CRASSA, *Sow. Min. Con.*, t. 557, f. 3, 1827.

*Testá crassá, suborbiculari, plano-convexá, lateribus subæqualibus; umbonibus acutis medianis, cardine marginali recto, obliquo declivi; lunulá parvâ obliquâ; basi arcuatâ, lineis concentricis crebris irregularibus.*

Shell convex, suborbicular, the sides nearly equal; umbones acute, mesial; hinge margin straight, oblique, and sloping; lunule small, oblique; base regularly rounded, concentric lines closely arranged and irregular.

The umbones are mesial and curved forwards, so that the anterior side of the shell is less produced than is usual with the genus; the degree of convexity near the umbones is moderate, and less than in *L. obliqua*. It occurs very rarely well preserved in the planking beds of the Great Oolite.

The specimen figured is contained in the collection of the British Museum.

Worn specimens of this species, of which the shell has become thin, and the exterior markings obliterated, are difficult to distinguish from what we consider a distinct species, *L. rotundata*, and which may prove to be only a variety.

*Locality.* Minchinhampton Common.

LUCINA ROTUNDATA, *Roemer, sp.* Tab. VI, figs. 14, 14 a.

! ASTARTE ROTUNDATA, *Roemer. Vers. Oolith.*, t. 6, f. 12, 1836.

*Testá subtransversá, inæquilaterá, oblique orbiculari, concentricè lineatá, convexá, anticè subproductá, complanatá; umbonibus parvis incurvis.*

Shell somewhat transverse, inequilateral, obliquely orbicular, concentrically lineated convex, anterior side rather produced; umbones small, incurved.

Specimens vary both in the degree of convexity, and in the proportions between the lateral diameter and the height, but the former measurement always exceeds the latter. The concentric lines or plications are very irregular and faintly marked, so as to give a general smoothness to the surface.

It occurs somewhat rarely in the shelly beds of the Great Oolite, and has also been recognised in the upper ragstones of the Inferior Oolite.

*Localities.* Minchinhampton Common in the Great Oolite; Rodborough Hill in the Inferior Oolite.

The figure showing the hinge has been copied from a specimen in the British Museum collection.

*LUCINA DESPECTA*, *Phil.* Tab. VI, figs. 16, 17.

*LUCINA DESPECTA*, *Phil. Geol. Yorksh.*, i, t. 9, f. 8, 1835.

— *CARDIOIDES*, *D'Archiac.* Mem. Soc. Geol. France, tom. v, t. 25, f. 6.

— *DESPECTA*, *junior*, tab. nost. vi, f. 16.

*Testá suborbiculari, obliquá, convexá; umbonibus parvis acutis, postmedianis, latere antico producto, postico brevi; superficie lineis concentricis crebris irregularibus.*

Shell suborbicular, oblique, convex, anterior side produced, posterior side short; umbones small, acute, situated posterior to the middle of the valves, and curved forwards; the surface with closely arranged, irregular concentric lines.

Having had the advantage (through the kindness of Mr. Bean) of comparing the original specimen (fig 17) figured in the 'Geology of Yorkshire,' we are enabled to affirm that *Lucina cardioides*, D'Archiac (Mem. Soc. Geol. Fran., vol. v, tab. xxv, fig. 6), represents the young of this species (Tab. VI, fig. 16); in that condition the shell is somewhat more convex, the concentric lines are prominent and less irregular than in the adult condition. *Lucina obliqua*, Goldfuss, (Petref., tab. 146, fig. 14,) is probably another synonym of the same species; these synonyms having been occasioned by the figure in the 'Geology of Yorkshire,' unaccompanied by any description not having been fully recognized.

The numerous specimens which we have examined present a considerable diversity in figure, depending chiefly upon the varying amount of obliquity; the substance of the test is thick, and in the ultimate stage of growth the concentric plications become both prominent and closely arranged. In the shelly beds of the great Oolite the greater number of specimens are diminutive; in the upper portion of the Inferior Oolite they are much larger.

*Localities.* Minchinhampton Common in the Great Oolite; Ponton, Lincolnshire; near Nailsworth, in the Inferior Oolite.

*CORBIS*, *Cuvier*, 1817.

*IDOTEA*, *Schumacher*, 1817.

*Gen. Char.* Shell transverse equivalve, umbones submesial, incurved, contiguous; surface imbricated or cancellated. Hinge, with two narrow triangular teeth, in each valve of which one is bifid, and two lateral teeth, the anterior of which are approximate, the posterior teeth remote. Muscular impressions lunulate, pallial impression simple.

*CORBIS LAJOYEI*, *D'Archiac.* Tab. VII, fig. 12, 12a, b.

*CORBIS LAJOYEI*, *D'Archiac.* Mem. Soc. Geol. Fr., tom. v, t. 27, f. 1, 1843.

*Testá crassá, convexá, transversè elongatá, umbonibus magnis medianis; anticè sub-*

*horizontali producto, posticè subrostrato, attenuato; margine cardinali subrecto, oblique declivi; costis concentricis crebris imbricatis; margine interno integro.*

Shell thick, convex, transversely elongated, umbones large mesial; anterior side produced subhorizontal; posterior side more attenuated, slightly rostrated; hinge border nearly straight, elongated, and sloping obliquely; concentric costæ densely arranged, regular imbricated; inner margins of the valves smooth.

A very rare shell readily distinguished from other contemporaneous species by the finer and more densely arranged costæ.

Height 16 lines; length 25 lines; diameter through both the valves 13 lines.

*Locality.* Minchinhampton Common, where it occurs in the bed of coarse planking.

**CORBIS LAJOYEI, *Var. cingenda.*** Tab. VII, fig. 11.

*Testá ovato-rotundatá concentricè costatá; costis magnis subdistantibus prominulis lamelliformibus; latere antico brevi, marginibus rotundis.*

Shell ovately rounded, convex, concentrically costated; costæ rather distant, regular, prominent, lamellar, anterior side short, margins rounded.

The figure is less elongated than in the preceding species, more especially the anterior side; the costæ are much more distantly arranged.

Height, one inch; length, an inch and a quarter; rare.

*Locality.* Minchinhampton Common, in the bed of coarse planking.

**CORBIS ASPERA.** Tab. VII, fig. 13, 13a.

CORBIS ASPERA, *Lycett.* Ann. Nat. Hist., Dec. 1850, pl. 11, f. 7.

*Testá ovato-elongatá, convexá, umbonibus subacutis prominulis, costis concentricis subacutis regularibus distantibus.*

Shell ovately elongated, convex, umbones prominent, mesial, rather acute; concentric costæ regular, distinctly arranged, and rather acute.

Compared with *C. cingenda*, the figure is more elongated, the umbones more pointed, and the costæ are more elevated and distantly arranged.

Height, 8 lines, length, 11 lines; but larger specimens occur in the Inferior Oolite.

*Localities.* Minchinhampton Common, in the Great Oolite; the vicinity of Nailsworth, in the Inferior Oolite.

*Sub-Genus, SPHÆRA, Sow.*

Shell thick, subæquilateral, equivalve, globose, umbones large, contiguous, directed forwards, lunule small, but slightly excavated, ligament external, surface smooth, or impressed only with the folds of growth. Hinge, massive, with two cardinal teeth in the right valve, these are thick and united beneath the umbo; the posterior one is prominent, and placed transversely to the hinge plate, the anterior one is oblique and elongated

forwards, having a pit above it to receive the anterior lateral tooth of the other valve. Left valve with two cardinal teeth, of which the anterior one is prominent, somewhat conical, and disunited from the other, there is also a small approximate anterior lateral tooth. Each valve has likewise a distant posterior lateral tooth, which is not very prominent.

As *Sphæra* has a considerable general resemblance to *Corbis*: we will concisely indicate the features whereby they are distinguished. In *Corbis*, the anterior side is the most prominent; *Sphæra*, is equilateral and oblique. The surface of *Corbis* is always cancellated having a denticulated inner border; *Sphæra*, has its surface smooth, or is marked only with the lines of growth, and the inner margin is acute and smooth. The hinge in the right valve of *Corbis* consists of two narrow triangular teeth placed like the sides of the letter V, the angle being at the umbo, the anterior lateral tooth being separate and distinct; in *Sphæra*, the cardinal teeth are thick, not angular or pointed, and the anterior one forms a thickened oblique, lengthened process, before which there is no lateral tooth. In the left valve the arrangement of the teeth is likewise different; in *Sphæra*, the anterior and larger cardinal tooth is obtusely conical and projecting; in the other genus it is trigonal and depressed, and the anterior lateral tooth is differently situated with respect to the teeth of the other valve. Allowing, then, that *Sphæra* is nearly allied to *Corbis*, there would appear to exist sufficiently distinctive characters to demand their separation subgenerically.

SPHÆRA MADRID. Tab. VII, fig. 14, 14a, b, c, d.

CARDIUM MADRID, *D'Archiac*. Mem. Soc. Geol. Fr., tom. v, pl. 25, f. 7, 1843.

CORBIS MADRID, *D'Orb*. Prodome Paléont., i, p. 309.

? CARDIUM INCERTUM, *Phil*. Geol. York., i, t. 11, f. 5, 1835.

*Testá crassá subglobosá, umbonibus magnis obliquis et contiguís. Valvis in ætate juniore levigatis subdepressis; in ætate adulto globoso plicis incrementi rugis, concentricis et irregularibus.*

Shell thick, subglobose; umbones large, directed obliquely forwards, and contiguous. In the young state the valves are rather depressed and smooth; in the adult state they become much more globose, and acquire concentric, irregular, and prominent folds of growth.

Considerable variation occurs in the figure of this species, the more globose specimens have the height and length of the valves almost equal, those which are more depressed have a greater length laterally and are nearly smooth; the latter characters are exhibited in specimens from the Inferior Oolite of Leckhampton Hill, where it occurs somewhat rarely. Our species ranks as one of the most abundant shells of the shelly beds of Great Oolite in the Minchinhampton district, and we have also detected it at several positions higher in the series, even to 120 feet above the Fuller's earth.

*Localities.* Minchinhampton and Bisley Commons, in the Great Oolite; in the shelly roe stone of the Inferior Oolite of Leckhampton Hill; and in the Forest Marble, near Frome.

*Genus UNICARDIUM. D'Orbigny, 1847.*

Shell thin, convex, ovately oblong; umbones contiguous, depressed; hinge margin elongated, nearly horizontal; margins of the valves rounded, not close fitting, but without any regular aperture. Hinge ligamentary, the ligament being external, supported by a thin shelly lamina, which is partly internal, and extends posteriorly the length of the hinge margin; beneath the umbo is a small depressed tooth in each valve, but these are nearly obsolete, and in the greater number of specimens cannot be distinguished. Muscular impressions elliptical; pallial impression simple. The external surface is destitute of ornament, but has large, concentric, irregular plications; the substance of the test is very thin.

The three species which we give as examples of *Unicardium*, belong to an extensive series of shells, several of which M. Agassiz has figured and described as *Mactromyæ*, but which are in fact perfectly distinct from another portion of the same genus, for which the name *Mactromya* may perhaps be retained; these latter are *Mactromya mactroides striolata*, *tenuis*, and *brevis*; these shells are distinguished by well-marked features, externally they have an oblique posterior angle, internally they have an anterior, oblique, elongated rib, and a large sinus in the pallial impression.

Three other species of the same author, viz., *M. globosa*, *æqualis*, and *rugosa*, have a figure much more convex, without any posterior angle; internally they are destitute of the anterior rib, and their pallial impression is simple; the latter group should therefore be removed from the *Myadæ*. M. D'Orbigny, ('*Prodrome de Paléontologie*,') has referred this group, together with other shells, to his new proposed genus *Unicardium*, the type of which is *Corbula cardioides*, of Phillips. *Unicardium* is described as resembling *Cardium*, but having only a single cardinal tooth in each valve.

*Unicardium* comprises a numerous group of species, several of which are so nearly allied in form as to be with difficulty distinguished. They occur throughout the Lias, the lower, the middle, and the upper Oolitic rocks of Europe, and it is probable that many species remain undescribed; they occur indifferently in beds of clay, in lias limestone, and in shelly oolite, in the latter case the valves are always disunited, but in the lias and other clays, and argillaceous limestones, the valves are invariably in apposition. Their habits were not gregarious, but, on the contrary, they always occur sparingly, and from the thinness of the test, have often sustained fracture or compression. From the borders of the valves not being close fitting, and perhaps from a considerable amount of lateral motion which the kind of union in the valves would permit, one valve frequently overwraps the other, producing a mistaken appearance of inequality in the valves, which may have led to the species first figured in the '*Geology of Yorkshire*,' having been assigned to *Corbula*.

We regard *Unicardium* as presenting a considerable resemblance to certain species of *Lucina*, and would arrange it in the Malacological series near to that genus.

UNICARDIUM VARICOSUM, Sow., Sp. Tab. VIII, figs. 7, 7a, b; 8a, b.

VENUS VARICOSA, Sow. Min. Con., t. 296, 1819.

? UNICARDIUM CORBISOIDEUM, D'Orbigny. Prod. de Paléont., i, p. 309, 1850.

— VARICOSUM, D'Orbigny. Ibid., p. 310.

*Testá subglobosá, umbonibus magnis, medianis antrorsum incurvis, lateribus brevibus, posticè subtruncato, marginibus rotundis, plicis concentricis tenuibus irregularibus.*

Shell very thin, subglobose; umbones large, mesial directed forwards; sides of the shell short, more especially the posterior side, which, differing from the usual form of the genus, is somewhat shorter than the other side; the margins of the valves are rounded and slightly irregular; the concentric plications are not prominent.

The nuclei of this species are impressed with one or more strongly-marked grooves, which pass downwards from the umbones towards the inferior border in each valve. Mr. Sowerby remarks that this species is "not remarkable for anything but the furrows that occur along the middle of the specimens, all of which are casts in a light-coloured limestone; the furrows are two upon each valve, one of them much larger than the other, and terminated before reaching the edge by a deep hollow; corresponding ridges must have existed inside the shell, but whether they were visible externally cannot now be discovered; the concentric furrows that are strongly marked upon some specimens would seem to indicate a thin shell. It is nearly globose, but not so deep as long; the line of the hinge is two thirds as long as the shell, and nearly straight; other characters of the hinge are not discoverable; the beaks are much incurved." (Min. Con., vol. iii, p. 173.)

*Localities.* Casts occur in the upper marly deposits of the Oolite at Felmersham, Blisworth, Kingsthorpe, Oundle, &c. The shells occur rarely in the Great Oolite of Minchinhampton Common.

UNICARDIUM IMPRESSUM. Tab. VIII, fig. 9a, b, c.

*Testá ovato-obliqua aut subquadrata, convexá; umbonibus contiguís submedianis, depressis, latere antico brevi, margine ejusdem rotundato, latere postico magis producto margine oblique declivi, margine superiori subhorizontali recto, basi curvatá, plicis concentricis magnis irregularibus.*

Shell obliquely ovate, or subquadrate, convex; umbones submedian, contiguous, and depressed; anterior side short, its margin rounded; posterior side more lengthened, its margin sloping obliquely; superior border nearly horizontal and straight, gaping slightly; lower border curved; concentric plications large and irregular.

In its young state this species is very delicate, more transverse or oblong, and depressed, its surface is nearly smooth. It is only in a very advanced stage of growth that the surface acquired large concentric folds, and the figure becomes subglobose, but the degree of obliquity and convexity varies very much even with individuals of the same size. The

ligamental area is elongated, smooth, and lanceolate, its margins are not in contact, but have between them a distinct elongated aperture, which is beneath the cushion of the ligament. It occurs very frequently in a crushed or imperfect condition, a circumstance which seems to indicate that it was not habitually a mud living species.

It is met with somewhat rarely throughout the shelly beds of the Great Oolite, and likewise in the middle division of the Inferior Oolite in Gloucestershire.

Compared with *U. globosum*, Ag., it is more elongated, depressed, and oblique; as the test is always preserved, and the valves disunited, we are precluded from examining the characters of the internal casts.

*Localities.* Minchinhampton and Bisley Commons in the Great Oolite; Leckampton and Selsley Hills in the Inferior Oolite.

UNICARDIUM PARVULUM. Tab. VIII, fig. 6, 6a.

*Testá parvá subdepressá, ovato-oblongá; umbonibus subanticis acuminatis, latere antico brevi, postico elongato; basi curvatá, lineá cardinis horizontali, subrectá; superficie subcompresso plicis concentricis irregularibus.*

Shell small, rather depressed, ovately oblong; umbones anterior and acute, anterior side short, posterior side elongated, base curved elliptically; hinge border lengthened, horizontal, and straight; surface somewhat compressed with irregular concentric plications.

This little species has less convexity, and is more oblong than is usual with this genus; the hinge border is nearly horizontal, but rounded at its extremity, and the valves do not gape perceptibly at the ligamental area; in many specimens there is an obscurely defined angle directed from the umbo to the antero-ventral border, and in common with other species there is much variation in the degree of obliquity and convexity. One of our specimens, a portion of which exposes the internal cast, has a very fine radiating striæ, of which there is no trace upon the external surface of the shell. It occurs not uncommonly in the shelly beds of the Great Oolite, and has also been recognised in the upper portion of the formation.

Height, 7 lines; length, 9 lines.

*Locality.* Minchinhampton Common.

CYPRICARDIA. Lam. 1801.

*Gen. Char.* Shell equivalve, inequilateral, oblique, transverse, anterior side short; hinge with two or three cardinal teeth in each valve, and one lateral tooth. Muscular impressions two in each valve; ligament external.

CYPRICARDIA BATHONICA, *D'Orb.* Tab. VII, fig. 8, 8a, b, c.

CYPRICARDIA BATHONICA, *D'Orbigny.* Prodrome de Paléont., p. 308, 1850.

*Testá ovato, transversá, inæquilaterá, turgidá, cordiformi, postico angulatá et elongato lævigatá; umbonibus magnis obliquis recurvis, cardine bidentato dentibus lateribus distantibus elongatis; margine integro postice subsinuato.*

Shell ovate, transverse, inequilateral, ventricose, heart-shaped, posterior side angulated, elongated and smooth; umbones large, oblique, slightly recurved; hinge with two large cardinal teeth and one distant elongated posterior lateral tooth; margin of the valve entire, slightly sinuated posteriorly.

This species approaches near to *C. cordiformis*, Deshayes, but it is more oblique or lengthened posteriorly; it occurs rather abundantly in the bed of coarse planking.

Height, 21 lines; length, 27 lines; diameter through the valves, 17 lines.

*Localities.* Minchinhampton Common; Ponton, Lincolnshire; in the Fuller's earth of Box Tunnel, near Bath.

CYPRICARDIA ROSTRATA, *Sow.* sp. Tab. VII, fig. 9, 9a, b.

ISOCARDIA ROSTRATA, *Sow.* Min. Con., t. 295, f. 3, 1819.

— — *Goldf.* Petref., p. 210, t. 140, f. 12, 1840.

— — *Morris.* Cat., p. 88, 1843.

? CARDIUM BEAUMONTI, *D'Archiac.* Mém. Soc. Géol. Fr., tom. v, t. 26, f. 4, (nucleus,) 1843.

*Testá subtrigoná, convexá; umbonibus angulatis, antemedianis, prominulis; lunulá parvâ excavatá; latere antico rotundo, postico truncato angulo obliquo carinato; dorso lævigato; lineis incrementi paucis, irregularibus.*

Shell subtrigonal, convex; umbones angulated, prominent, anterior, and incurved; lunule small, excavated; anterior side rounded, posterior side truncated and somewhat concave, its inner border forming a prominent and obtuse angle; the surface of the shell is smooth, and marked only with a few faintly impressed lines of growth.

The hinge line posteriorly is nearly horizontal, forming an angle with the posterior sloping margin, the margin itself forming an acute angle with the inferior borders.

Height, 10 lines; lateral diameter, 11 lines; diameter through both the valves usually about 8 lines, but the latter measurement varies in individuals.

It occurs abundantly in the form of nuclei in the upper portion of the Great Oolite, and very rarely with the test preserved, in the shelly beds of the formation. The figure of *D'Archiac* has a greater height than is exhibited by our specimens, and the umbones are less inclined forwards, but looking at the great varieties of figure which the nuclei assume, we do not see any sufficient reason to regard it as a distinct species.

*Localities.* Minchinhampton Common; Oxfordshire; Northamptonshire.

CYPRICARDIA NUCULIFORMIS, *Roemer*, sp. Tab. VII, fig. 10, 10a, b..

CYRENA NUCULIFORMIS, *Roemer*. Verst. Oolith., t. 9, f. 13, 1836.

*Testá subtrigona aut cuneiformi, inæquilatérá; umbonibus anticis contiguís, margine antico rotundo, postico elongato et recto, basi curvatá, subsinuatá, cardine bidentato dentibus lateribus magnis.*

Shell subtrigonal or cuneiform, very inequilateral; umbones anterior, contiguous; anterior margin rounded, posterior margin elongated and straight; base curved, slightly sinuated; hinge with two cardinal teeth in each valve and a large lateral tooth placed at some distance from the others. The general form is rather compressed; the concentric plications are distinct, but not very prominent.

It occurs somewhat rarely in the shelly beds of the formation, also occasionally in the upper beds in the form of casts.

Height 8 lines; length, 12 lines; diameter through both the valves, 5 lines.

*Locality.* Minchinhampton Common.

#### HIPPOPODIUM, *Sow.* 1819.

A solitary specimen of this genus has been found by us in the Stonesfield slate of Oxfordshire; unfortunately it is in too imperfect a condition for description or comparison, but it bears a general resemblance to some specimens of *H. ponderosum*, *Sow.*, and we have recorded the fact of its occurrence with the view of drawing further attention to the subject.

#### MYOCONCHA, *Sow.*, 1824.

*Gen. Char.* Shell equivalve, transverse, very inequilateral, umbones small, depressed, subterminal; hinge border lengthened, straight, having an external elongated groove parallel with it, and extending from the umbo posteriorly to the extremity of the shell, ventral margin entire, not sinuated, and parallel with the hinge border. Hinge, with an elongated cardinal tooth in the right valve, situated beneath the umbo, and which is received into an elevated cavity in the other valve; there is also in each valve a lengthened posterior thickened plate or rib, serving to support the ligament, which is external. Muscular impressions, two in each valve, of which the anterior are rounded, and bounded internally by an elevated and thickened plate which projects from beneath the cardinal tooth; posterior impression expanded; pallear impression not sinuated.

MYOCONCHA CRASSA, *Sow.* Tab. III, fig. 16, 16a.

MYOCONCHA CRASSA, *Sow.* Min. Con., t. 467, 1824.

— — *Bronn.* Leth. Geog., p. 237, t. 20, f. 15, 1851.

MYTILUS SULCATUS, *Goldfuss.* Petref., t. 129, f. 4, 1840.

*Testá subellipticá, fornicatá, concentricè striatá, lineis radiantibus irregularibus, tenuissimis undulatis, sæpissime obsoletis; umbonibus parvis; sulco elongato postico semper notato.*

Shell subelliptical, ridged, concentrically and irregularly striated, with very fine longitudinal waved lines, frequently obsolete; umbones small; posterior elongated, external groove always visible.

The few Great Oolite examples of this well-known shell are of much smaller dimensions than those which are so abundant in the lower or Ammonitiferous beds of the Inferior Oolite at Dundry, they are likewise more compressed; they have only a moderate degree of thickness, and the fine lines radiating from the umbones can rarely be discovered; these variations are such as might be expected to occur in a species which possesses so considerable a geological range, and they are moreover precisely similar to those which the species presents when it is found in the middle or freestone division of the Inferior Oolite, in Gloucestershire.

Dimensions of the larger Great Oolite specimens:—

Height, 14 lines; longitudinal diameter, 27 lines; diameter through both the valves, 8 lines.

*Localities.* Minchinhampton Common; Barnack, Northamptonshire; Ponton, Lincolnshire.

MYOCONCHA ACTÆON, *D'Orbigny*. Tab. III, fig. 17, 17a.

MYOCONCHA ACTÆON, *D'Orbigny*. *Prodrome de Palæont.*, p. 312, 1850.

*Testá ovato-oblongá subdepressá, marginibus superioribus et inferioribus parallelis, margine postico subrecto, umbonibus parvis, depressis, plicis concentricis paucis irregularibus.*

Shell ovately oblong, the superior and inferior borders straight and nearly parallel, the posterior border nearly square; the umbones very small and depressed, posterior sulcus distinct; concentric plications few and irregular.

On comparison with *Myoconcha crassa*, this shell is more depressed, less pointed at the extremities, the posterior border more especially being quadrate; the superior and inferior borders are more nearly straight or parallel, and no radiating lines are visible upon the surface.

Length, one inch and three quarters; height, one inch.

*Locality.* Minchinhampton Common, where it occurs in the bed of coarse planking.

MYOCONCHA ELONGATA. Tab. III, fig. 18.

*Testá soleniformi, elongatá, subdepressá, umbonibus parvis contiguis depressis, latere antico angusto, postico latiore et compresso, marginibus superioribus et inferioribus rectis, parallelis, plicis incrementi paucis tenuibus.*

Shell pod-shaped, elongated, rather depressed; umbones small, contiguous, depressed;

anterior side, narrow, posterior side wider and more compressed, upper and lower margins straight and nearly parallel, concentric plications few and delicate.

A species unusually elongated and compressed posteriorly; it appears to be destitute of radiating lines, judging from three examples which are the whole that have passed under our notice.

Height, 8 lines; length, 21 lines; diameter through both the valves, 6 lines.

*Localities.* Minchinhampton Common, in the Great Oolite; it occurs also in the Inferior Oolite of the same district.

### PACHYRISMA, *Morris and Lycett*, 1850.

PACHYRISMA, *Deshayes*, 1851.

*Testá oblongá, cordiformi, æquivalvi, valdè inæquilaterali, crassissimá, læviusculá aut concentricè striatá; umbonibus magnis angulatis contiguis et involutis, anticè recurvis; cariná obtusá, dorsali, posticá; ligamento externo, crasso, subelliptico, umbones versus bifurcato. Dente et foveá cardinali unicá in utrâque valvâ; dente magno, obtuso, irregulariter conico lateribus compressis, et dente parvo accessorio in valvâ dextrâ; impressionibus muscularibus duabus; posticâ obliquâ in laminâ internâ sitâ; anticâ oblongâ excavatâ processu dentiformi supernè instructâ.*

Shell oblong, cordiform, equivalve, very inequilateral, thick, with large, angulated, contiguous, and involute umbones diverging anteriorly; an obtuse-angled posterior dorsal keel divides the surface into two portions; ligament large, external, somewhat elliptical and bifurcated towards the umbones, to the apices of which a groove passes for its reception, as in *Isocardia*. Hinge massive, consisting of a single large, obtuse, conical tooth in each valve, compressed laterally; and a pit by the side of it to receive the corresponding cardinal tooth of the other valve; the right valve has, in addition, a small accessory tooth placed upon the anterior margin of the cardinal pit. Muscular impressions two, the posterior one is supported upon a raised projecting plate, which descends from beneath the hinge obliquely backwards, the position of which is marked upon the external surface by a slight furrow; anterior impression deeply excavated, of an oblong form, and with a small tooth upon its upper margin.

This genus has some affinities with *Isocardia*, *Opis*, and *Megalodon*, the latter of which it appears to represent in the Jurassic period, and with it may constitute a family "*Megalonidae*." It is distinguished from *Megalodon* by the cardinal tooth in the right valve not having been divided as in the latter genus. *Megalodon* has the anterior muscular impression upon a somewhat raised or lamelliform plate; but the posterior raised plate of *Megalodon* presents a near approximation to that of *Pachyrisma*. From *Opis* it is sufficiently distinguished by the characters of the dentition. The dichotomous ligament resembles that of *Isocardia*, and when viewed anteriorly, it reminds us of the recent *Isocardia cor.*, with its large and graceful diverging umbones. *Pachyrisma*, then, may be

described as a *Megalodon-like* shell, the dental characters of which, however, are peculiar, combined with the external figure of *Opis* and *Isocardia*.

A detailed description of this genus and its affinities will be also found in the valuable and useful work of Mons. G. P. Deshayes, the 'Traité Élémentaire de Conchologie.'

PACHYRISMA GRANDE, *Lycett*. Tab. VIII, figs. 1—5.

PACHYRISMA GRANDE, *Morris* and *Lycett*. Journal of the Geol. Society, 1850, p. 401.

— — — *Deshayes*. Traité Élémentaire de Conch., ii, p. 187, pl. 32bis, f. 1—3.

*Testá cordatá, elongatá; cariná obtusá, dorsali, posticá, latere antico brevi; latere postico profundé depresso; striis numerosis, concentricis, irregularibus.*

Shell cordate, with an obtuse, prominent, posterior, dorsal keel; posterior side deeply excavated, with a mesial oblique furrow, forming with that of the other valve a cordiform surface; striæ numerous, concentric, and irregular.

In young specimens the form is less gibbous, the small dental processes are very distinct, but the large tooth has little of the prominence which it afterwards attains, it not having acquired the conical projecting form as in the adult state.

The massive character of the hinge, umbones, and anterior side of the shell, presents a striking contrast with the attenuation of the posterior side; this latter portion is consequently very rarely well preserved, although the internal projecting oblique plate must have contributed to strengthen this part; the small dentiform processes bordering the anterior muscular impression are just in contact when the valves are closed, that of the left valve being received into a small depression above the corresponding process of the right valve, the tooth of the right valve resting within the muscular impression of the opposite one. The thickness of this portion of the test is such that in an individual which measured six inches across, it was upwards of three quarters of an inch.

Our shell nearly resembles a figure published by Catullo<sup>1</sup> of a cast of a shell named *Cardium triquetum*, by Wolfen,<sup>2</sup> from the Jurassic strata of Antello, near Cardonino. The shells figured by Pusch, (Polens. Palæont., t. vii, figs. 8, 9,) under the names *Isocardia exaltata*, and *I. ventricosa*, have some affinity with our shell, and may belong to the same genus.

*Geological position.* This species occurs near to the base of a series of hard cream-coloured limestone beds which extend from Minchinhampton to Cirencester, the base line of which has at one locality been ascertained to be forty-five feet above the Fuller's earth; the position is therefore higher than the shelly weatherstones of Minchinhampton Common, and near to the middle of the formation. The limestones have, in the aggregate, a very considerable thickness, but become browner and more sandy upwards. It is impossible to disengage the crystalline tests from the hard limestone, but an accidental seam of softer

<sup>1</sup> 'Saggio di Zoologia Fossile,' de T. A. Catullo, t. 1, f. D, E, F, f. 2 A; Padua, 1827.

<sup>2</sup> 'Abhandl. von Kärnthenschen pfauenschen. Helmintholith.,' p. 48.

and less homogeneous rock has enabled us to disclose the interior of the valves in many instances. The valves occur of all sizes, both in conjunction and disunited; the habits of the species were gregarious to the almost entire exclusion of other Mollusks, a few casts of *Purpuroidea* and *Natica*, however, accompany it. *Pachyrisma* occupies a vertical thickness of only half a yard, and its horizontal extension would likewise appear to have been very limited; hitherto it has been found only at two localities of the same neighbourhood.

*Locality.* The vicinity of Minchinhampton and Chalford.

OPIS. *Defrance*, 1825.

CARDITA, Sp., *Sow.*, 1819.

*Gen. Char.* Shell subtrigonal or cordate, thick, the valves convex, arched, the posterior side being separated from the anterior by an angle or carina; umbones prominent, large, curved spirally outwards and forwards; lunule large, cordiform, sometimes deeply excavated. Hinge massive, the right valve with a large obliquely pyramidal tooth compressed laterally, posterior to which is a narrow and deep cavity, with parallel sides; the left valve with a large subquadrate cavity to receive the tooth of the other valve, and a small accessory tooth extending along the posterior margin. Ligament external. Muscular impressions strongly marked and rounded; pallial impression simple.

OPIS LUNULATUS, *Sow.* var. Tab. VI, figs. 3, 3 *a*, *b*, *c*.

CARDITA LUNULATA, *Sow.* Min. Con., p. 55, t. 232, f. 1, 2, 1819.

OPIS LUNULATUS, *Morris.* Catalogue, p. 96, 1843.

— — *Blainville.* Malacol., t. 70 bis, f. 1,

*Testá trigoná, ventricosá, concentricè lineatá; umbonibus magnis involutis, carinâ dorsali subacutâ, elevatâ, latere postico abrupte-plano; lunulâ cordatâ profundâ, marginibus acutis.*

Shell trigonal; umbones large, angular, terminal, and curved outwards, the posterior side bounded by a prominent and acute angled carina; anterior side with closely arranged regular concentric lines; posterior side flattened or slightly excavated, smooth, or with faintly-marked oblique lines; lunule smooth, cordate, large, deep, its margins acute.

This thick shell, with the valves disunited, is one of the most abundant bivalves of the Great Oolite shelly beds; the size of the lunule varies very much, as likewise does the number and prominence of the concentric lines; occasionally, indeed, the surface appears to have become quite smooth in the more advanced stage of growth.

The height and lateral diameter are of equal dimensions; the diameter through both the valves is one third less.

Upon comparison with the typical form from Dundry, this variety is observed to be smaller, less elongated, the lunule usually larger, and its margins more acute, but we do not regard these differences of more importance than might be expected to occur in shells procured from a different stratum and locality.

*Localities.* The whole of the Minchinhampton district in the Great Oolite; Ponton, Lincolnshire.

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A MONOGRAPH

OF THE

MOLLUSCA FROM THE GREAT OOLITE,

CHIEFLY FROM

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AND

THE COAST OF YORKSHIRE.

BY

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OPIS SIMILIS, *Sow.*, sp. Tab. VI, figs. 4, 4a.

CARDITA SIMILIS, *Sow.* Min. Con., p. 56, t. 232, f. 3, 1819.

OPIS SIMILIS, *Morris.* Catal., p. 96, 1843.

*Testá subrhomboidéá, fornicatá, concentricè lineatá, umbonibus terminalibus incurvis, cariná dorsali acutá, latere postico abrupto, lunulá planá.* (Goldfuss.)

Shell nearly rhomboidal or cordiform, elongated; umbones terminal, rather angulated and incurved; dorsal surface with an elevated acute angle; the lunule is very small and cordiform, its borders rounded; the anterior portion of the surface has concentric lines, which pass over the carina, and are soon lost upon the flattened posterior surface.

The height, measured along the dorsal carina, very much exceeds the lateral diameter, the shell being much produced and pointed at the posterior and inferior extremity; it is associated with *Opis lunulatus* in the shelly beds of the Great Oolite, but is much less common; compared with that species it is much more lengthened and oblique, the lunule minute, and the lines are much more delicate and closely arranged.

*Localities.* Minchinhampton and Bisley Commons in the Great Oolite; Ancliff, Wiltshire; Ponton, Lincolnshire. Cloughton Wyke, Yorkshire. (Phillips.)

OPIS DESHAYESII. Tab. VI, figs. 5, 5a.

*Testá elongatá, angustá, trapeziformi, concentricè costatá, anticè depressá, posticè acute-carinatá, sublævigatá, subsinuatá; costis regularibus depressis; lunulá magná excavatá, marginibus rotundis; umbonibus elutis, angustis, incurvis.*

Shell elongate, narrow, trapeziform, the sides concentrically costated; anterior side depressed, truncated; posterior side acutely carinated, the carina separating a posterior depressed and smooth area from the costated portion of the shell; the posterior margin of the shell forms an angle at its middle part; lunule large and deep, its margins rounded; umbones elevated, angulated, and compressed at the sides.

The general figure is compressed, elongated, and attenuated, irregularly pentagonal, the anterior side being the most wide. The absence of an anterior angle is sufficient to distinguish it from *Opis cardissoides*, Goldfuss; but the two species which approach most nearly to it are the *Opis Archiaciana* and *O. Michelinea*, figured and described by M. Buvignier in his work on the 'Geology and Palæontology of the Department of the Meuse:' but in neither of the latter species does the convexity of the valves equal that of our shell; they are comparable to it in the elevation and attenuation of the umbones, but are destitute of the regular concentric costæ.

Height,  $5\frac{1}{2}$  lines; opposite diameter,  $3\frac{1}{2}$  lines; diameter through both the valves, 4 lines. Rare.

*Localities.* Quarhouse, Bisley Common, and Minchinhampton Common; Ancliff, Wiltshire.

ASTARTE. *Sow.*, 1817.

*Gen. Char.* Shell equivalve, inequilateral, thick, the surface usually concentrically costated, the margins of the valves close, and internally crenulated. Hinge with two diverging cardinal teeth in each valve, those of the left valve being elongated and nearly equal, those of the right valve unequal, the anterior one being small. Muscular impressions two; ligament external.

ASTARTE SQUAMULA, *D'Archiac.* Tab. IX, fig. 9.

ASTARTE SQUAMULA, *D'Archiac.* Mém. Soc. Geol. Fr., vol. v, pl. 25, f. 5.

*Testá ovato-orbiculari, subdepressá, umbonibus medianis acutis, lunulá ovato-lanceolatá, costis concentricis, crebris, irregularibus et depressis, nonnunquam obsoletis.*

Shell ovately orbicular, rather flattened; umbones mesial, prominent, and acute; lunule ovately lanceolar, and but little excavated; hinge margin lengthened and rounded; concentric costæ numerous, irregular, and depressed, sometimes obsolete.

The valves of this little depressed species occur in considerable numbers throughout the shelly beds of the formation in the Minchinhampton district; in the greater number of instances the surface is smooth, probably by erosion. The lateral diameter is one fifth greater than the height, and in the largest examples does not exceed six lines. Individuals vary moderately, both in the outline and the convexity of the valves, but a considerable number can easily be obtained for comparison.

*Localities.* Minchinhampton. Eparcy, France.

ASTARTE MINIMA, *Phil.* Tab. IX, fig. 10a, b.

ASTARTE MINIMA, *Phil.*, Geol. Yorksh., t. 9, f. 23.

? ASTARTE PULLA, *Roemer*, Nordd. Ool., p. 113, t. 6, f. 26.

*Testá convexá, ovato-orbiculari; umbonibus submedianis; costis regularibus convexis, interstiis æqualibus (circa 14).*

Shell convex, ovately orbicular; umbones nearly mesial; costæ (about fourteen in number) regular, rounded, elevated, and equal in breadth to the interstitial spaces.

This little shell is not associated with any other at all resembling it, but from its minuteness, it is probably often unnoticed; it does not appear to be abundant (at least in the Minchinhampton district, from which our specimens have been obtained).

The lateral diameter exceeds the height by about one third, and rarely equals 4 lines.

*Localities.* Minchinhampton Common, in the soft beds of Oolite beneath the planking; Ponton, Lincolnshire; Scarborough, in the grey limestone of the Great Oolite.

## ASTARTE PUMILA, Sow. Tab. IX, fig. 13a, b.

ASTARTE PUMILA, Sow. Min. Con., t. 444, f. 2, p. 64.

— — ? Goldfuss. Petref., t. 134, f. 16.

— — Morris. Catal. Brit. Foss., 1854, p. 187.

*Testá parvá, convexá, ovatá, umbonibus acutis, postmedianis, antrorsum incurvis, lunulá parvá, mediocre depressá, costulis regularibus, obtusis, crebris, interstiis angustioribus.*

Shell small, convex, ovate; umbones acute, postmesial, but directed somewhat forwards; lunule small, moderately depressed; concentric costæ regular, obtuse, closely arranged, the interstitial spaces very narrow.

The height is always greater than the lateral diameter, a character which differs from the shell figured by Goldfuss, the latter probably being a different species; the depression of the lunule varies in different individuals, but never has the deep concavity figured by Goldfuss. The height is usually about 3 lines; it is somewhat rare.

*Localities.* Ancliff and Minchinhampton.

## ASTARTE EXCENTRICA. Tab. IX, fig. 8a, b.

*Testá parvá, ovato-orbiculari convexá, umbonibus medianis acutis, lunulá minimá; plicis incrementi paucis, magnis et irregularibus; costis crebris depressis, interstiis angustioribus; costis superioribus subundatis, excentricis, inferioribus semel subundatis sed concentricis.*

Shell small, ovately orbicular and convex; umbones mesial and pointed; lunule very small; folds of growth few, strongly marked, and irregular; costæ very densely arranged, depressed, the interstitial spaces very narrow; the superior costæ are slightly undulated, and are excentric, passing across the surface of the valves very slightly inflected; the inferior costæ are concentric, but are likewise slightly undulated.

The finely ornamented surface of this little shell is scarcely visible except under a magnifier; the costæ are flattened, and so closely arranged that the interstitial spaces are mere striæ; there is also about the borders of the costæ a kind of obscurely wrinkled appearance, or as though they were slightly crenulated; the superior or excentric costæ occupy a surface less than the inferior ones, and the two kinds are separated by a prominent fold of growth. Our little species does not appear to be very abundant, it occurs with other small shells of the same genus in the beds of soft shelly Oolite which underlie the planking.

Height and lateral diameter equal, or about 4 lines.

*Localities.* Minchinhampton and Bisley Commons.

## ASTARTE ROTUNDA. Tab. IX, fig. 12.

ASTARTE ORBICULARIS, Sow. Min. Con., t. 520, f. 2.

— ROTUNDA, Morris. Catal. Brit. Foss., p. 187.

*Testá crassá orbiculatá, convexá, umbonibus submedianis acutis, margine cardinali obliquo, elongato, subrecto, lunulá magná lanceolatá, plicis incrementi paucis, irregularibus; costis depressis, crebris et irregularibus.*

Shell thick, orbicular, convex; umbones nearly mesial, prominent, acute; hinge margin oblique, lengthened, and nearly straight; lunule large and lanceolate; folds of growth few and irregular; costæ depressed, small, closely arranged, and irregular.

The general figure has a considerable degree of convexity; the umbones are small, pointed, and curved forwards, and are placed somewhat nearer to the anterior than posterior side of the valves; the extremity of the lengthened hinge border forms an angle with the inferior margin. It is rare.

Height nearly equal to the lateral diameter, which is  $2\frac{1}{4}$  inches; the diameter through both the valves is  $1\frac{1}{2}$  inch.

*Locality.* Minchinhampton Common, in the planking.

## ASTARTE? RHOMBOIDALIS, Phil., sp. Tab. IX, fig. 20.

ISOCARDIA RHOMBOIDALIS, Phil. Geol. York., 1, t. 3, f. 28.

HIPPOPODIUM LUCIENSE, D'Orb. Prod. Paléont., p. 308.

— BAJOCIENSE, D'Orb. Ib., p. 277.

*Testá crassá convexá, subquadratá, vel oblongá, umbonibus anticis obtusis, margine cardinali elongato, subhorizontali, lunulá magná, excavatá, margine inferiore subrecto et sinuato, marginibus internis integris, superficie plicis incrementi paucis, magnis, distantibus; striis concentricis tenuissimis regularibus crebris. Ætate senili striis concentricis obsoletis, plicis rugis magnis irregularibus.*

Shell thick, convex, subquadrate, or oblong; umbones anterior, obtuse; hinge margin elongated, subhorizontal, but slightly arched; lunule large, elliptical; inferior margin nearly straight, parallel to the superior border, and slightly sinuated; internal margins of the valves plain, acute; folds of growth few, large, and distant; concentric striations regular, delicate, and closely arranged. In an advanced stage of growth the concentric striations disappear, and the surface became rugose with the irregular plications of increase. An oblique prominence or obscure angle extends downwards posteriorly, and becomes prominent in specimens which are short and have the superior border much arched. The Great Oolite examples are very numerous, and for the most part rather flattened and rugose with adherent shells, the largest specimens not unfrequently having been perforated or grooved by the Lithophagidæ; the substance of the test is very thick, and the muscular impressions are deeply excavated; the cardinal teeth are remarkably large and massive.

*Localities.* The vertical range of this remarkable species is very considerable; it occurs in the Inferior Oolite of the Cotteswolds, the Great Oolite of Minchinhampton, the Coralline Oolite of Malton, and we have seen fine casts from the Kimmeridge Clay of Wilts. The *Hippopodium Luciense* and *H. Bajociense*, D'Orb., are probably identical with this species.

ASTARTE EXCAVATA, Sow., var. COMPRESSIUSCULA. Tab. IX, fig. 18, 19.

ASTARTE EXCAVATA, Sow. Min. Con., t. 233.

— COMPLANATA, Roemer. Nordd. Oolith., t. 6, f. 28.

*Testá ovatá, transversá, compressá, umbonibus parvis anticis depressis, margine cardinali, elongato, carvato, subhorizontali, margine inferiore elliptico, lunulá angustá excavatá, margine acuto. Costis externis concentricis depressis irregularibus interdum confertis aut enim obsoletis. Ætate juniore testá planatá et fragili, costis paucis latis prominulis.*

Shell ovately transverse, compressed; umbones small, anterior, and much depressed; hinge border elongated, nearly horizontal, and curved; lower border regular, elliptical; lunule deeply excavated, its margins acute; concentric costæ depressed, irregular, sometimes nearly obsolete. In the young state the shell is flattened, very delicate, pellucid, and has a few distinct broad concentric costæ near to the umbones.

In the shelly beds of the Great Oolite, the young delicate shells occur abundantly from 3 to 6 lines in length. Adult specimens are much more rare, and few exceed 20 lines in length.

The tenuity of the test is considerable; and this feature, together with the greater flatness, will serve to distinguish it from the typical form, *A. excavata*, Sow., which is a much larger and thicker shell. Notwithstanding its tenuity, flatness, and the small dimensions, we believe this to be only a variety of the well-known Inferior Oolite shell, induced by peculiarities of the stratum in which it occurs. The same change of aspect takes place in the freestone beds of the Inferior Oolite; but the form again attains its pristine dimensions and thickness in the upper ragstones higher in the series.

*Localities.* Minchinhampton Common in the Great Oolite; Nailsworth Hill, in the freestone beds of the Inferior Oolite.

The typical shell occurs abundantly at Dundry and at Rodborough Hill.

ASTARTE DEPRESSA, Goldf. Tab. IX, fig. 11.

ASTARTE DEPRESSA, Goldfuss. Petref., p. 192, t. 134, f. 14.

*Testá compressá, transversim ovato-orbiculari; umbonibus medianis obtusis; lunulá ellipticá, angustá, costis convexis interstis concentricè striatis.* (Goldfuss.)

Shell compressed, transverse, ovately orbicular; umbones median, prominent, obtuse;

lunule elliptical, narrow; cardinal margin nearly straight, oblique; concentric costæ convex, irregular, with fine interstitial concentric striæ.

The lateral diameter is one fifth greater than the height; the smaller specimens are those which display the characters of the species most distinctly; with increase of growth the shell acquired some additional convexity, and the costæ became less distinctly elevated.

*Locality.* It occurs somewhat rarely in the shelly beds of the formation at Minchinhampton, and likewise in the middle division of the Inferior Oolite of the same district.

ASTARTE ANGULATA. Tab. IX, fig. 17*a*, *b*.

*Testá crassá transversá, subtetragoná, aut cuneiformi; umbonibus anticis prominentibus; margine antico rotundato, postico elongato, subrostrato, dorso oblique subinflexo; striis concentricis crebris, irregularibus.*

Shell thick, transverse, somewhat triangular or wedge-shaped; umbones prominent and anterior; anterior margin short and rounded; posterior margin elongated, slightly curved, and rostrated; dorsal surface slightly bent by an obscure angle, which passes obliquely downwards to the posterior extremity; striæ concentric, closely arranged, and irregular.

A sulcus borders the posterior side of the shell throughout its length; it is smooth, and the margin separating it from the dorsal surface is acute. This character will readily distinguish it from contemporaneous species of the genus.

This small shell is not very common: it occurs with other small Veneridæ in the soft Oolite which underlies the planking.

*Locality.* Minchinhampton Common.

ASTARTE ELEGANS, Sow. Tab. XIV, fig. 14.

ASTARTE ELEGANS, Sow.		Min. Con., t. 137, f. 3.
—	—	<i>Phil.</i> Geol. York., 1, t. 11, fig. 41.
—	—	<i>Goldf.</i> Petref., t. 134, f. 12.
—	—	<i>Zeiten.</i> Petref., t. 61. f. 4.
—	—	<i>Morris.</i> Catal., 1854, p. 186.

*Testá ovato-obliquá plano-convexá, crassá; umbonibus antemedianis prominentibus; lunulá excavatá, marginibus rotundis; lateribus plicis concentricis magnis elevatis subacutis, plerumque regularibus; marginibus internis denticulatis.*

Shell ovately oblique, with a low convexity; test thick; umbones prominent, anterior, and curved forwards; lunule excavated; border of the valves rounded; surface with large, elevated, and rather acute, usually regular concentric plications; inner margins of the valves denticulated.

Specimens vary much in the degree of obliquity and convexity.

This very common Inferior Oolite species occurs rarely in the Great Oolite, but it is absent in the shelly beds of the formation in Gloucestershire.

*Geological position and localities.* Minchinhampton and Scarborough in the Great Oolite; the Cotteswolds, Dundry, Yeovil, and Brora in the Inferior Oolite; Malton in the Coralline Oolite.

ASTARTE INTERLINEATA., *var. Lye.*, sp. Tab. IX, fig. 14, 15a, b.

HIATELLA ? INTERLINEATA, *Lycett.* Ann. and Mag. Nat. Hist., 1850, p. 421.

*Testá parvâ subquadratâ vel oblongâ, convexo-planâ; umbonibus acutis, parvis, antemedianis; lunulâ excavatâ; margine superiori et inferiori parallelis subrectis, antico rotundo, postico truncato, angulo obliquo; costis longitudinalibus magnis, postice in angulo flectis et trinodulosis; striis interstitialibus tenuissimis instructis.*

Shell small, subquadrate or oblong, slightly convex; umbones acute, small, depressed, and placed anterior to the middle of the valves; lunule excavated; superior and inferior margins parallel, horizontal, and straight; anterior border rounded; posterior border truncated; longitudinal costæ few, somewhat irregular, large, and rounded in the Great Oolite variety, bent posteriorly upwards, forming an acute angle; their posterior portions have also in this variety three rather obscure nodules; the interstitial spaces have very fine longitudinal striations.

This species presents itself under two varieties of aspect, one of which occurs in the middle portion of the Cotteswold Inferior Oolite. This latter and more smooth variety has the figure somewhat shorter, the costæ rather more distant; they are also more narrow and acute; and posteriorly they have not the nodules of the other variety. It must not, however, be inferred that these distinctions are preserved in all specimens; on the contrary, the posterior nodules are uncertain in their distinctness; the number of costæ and their size are equally variable. The test is delicate.

Height, 3 lines; length,  $4\frac{1}{2}$  lines; diameter through both the valves, 2 lines: but the greater number of specimens have smaller dimensions.

*Geological position and localities.* *Astarte interlineata* occurs in the shelly freestone of the Inferior Oolite of Leckhampton and of the Minchinhampton, and likewise in the shelly Great Oolite of the latter locality.

ASTARTE WILTONI. Tab. IX, fig. 16.

*Testá ovato-subangulâ planâ, umbonibus anticis acutis; costis apicalibus concentricis paucis, magnis.*

Shell ovately subangular or subquadrate, flattened; umbones anterior, acute; the surface with a few acute concentric costæ near to the apex; the other portion of the surface nearly smooth.

The surface ornaments nearly resemble *A. striato-costata*, Munster, Goldf. Pet., tab. 134, fig. 18; but the latter shell has much larger dimensions, is somewhat more convex, and has not the subquadrate figure of our species. It is somewhat rare. The name from John Wilton, Esq., of Gloucester, who has investigated the minute anatomy of the univalve Mollusca.

Lateral diameter, 6 lines; height, 5 lines.

*Locality.* Minchinhampton Common, in a bed of soft Oolite, which underlies the planking.

ASTARTE RECONDITA, *Phil.*, sp. Tab. XII, fig. 10.

*Syn.* PULLASTRA RECONDITA, *Phil.* Geol. York., 1, t. 9, f. 13.

*Testá parvá, ovato-oblongá, subdepressá; umbonibus obtusis, anticis; margine cardinali subhorizontali, basi ellipticá curvatá, superficie striis concentricis paucis magnis; lunulá excavatá.*

Shell small, ovately oblong, rather depressed; umbones obtuse, anterior; hinge border elongated, nearly horizontal; basal margin curved elliptically; lunule excavated; the surface near to the umbones has a few large obscure concentric striations, which disappear towards the middle of the shell.

In figure, this little shell bears some resemblance to the young of *Astarte rhomboidalis*, but it is more flattened, and is destitute of the posterior angle of that species; the few rugose striations near to the umbones is another distinctive feature.

*Locality.* Ponton, Lincolnshire, where it has occurred rather sparingly in the coarse Oolite. In Yorkshire, Professor Phillips records it in the Great Oolite of Cloughton Wyke.

#### CYPRINA. *Lam.*

*Gen. Char.* Shell equivalve, inequilateral, transverse, subglobose or subovate; umbones curved obliquely; ligament external; hinge with three diverging cardinal teeth, and a remote laminar or lateral tooth in each valve; muscular impressions, two, lateral; pallial impression slightly angulated posteriorly; margins of the valves close, smooth internally.

CYPRINA LOWEANA. Tab. XIII, fig. 2 2a—d

*Testá transversim ovali, lævi, convexá; umbonibus antemedianis crassis; lunulá ovatá parvá, areá lanceolatá, latere postico subcompresso, infernè subangulato; striis concentricis tenuissimis irregularibus frequentèr obsoletis.*

Shell transversely ovate, smooth, convex; umbones anterior, thick, and large; lunule ovate, but slightly excavated; area lanceolate; anterior side rounded; posterior side rather compressed, and slightly angulated at its inferior extremity; the surface has very fine irregular concentric striations, which in the greater number of instances are obsolete.

In none of the Oolitic forms do we find a greater variety of figure than in this species, and without ample materials for comparison, its examples would probably be regarded as pertaining to more than one species; these variations, which are irrespective of growth, refer to the degree of convexity, the extent to which the valves are produced posteriorly, and the more or less compressed and angulated, or, on the other hand, rounded and convex figure of the posterior side of the shell. The valves occur in such considerable numbers, and so fully illustrate all these minor variations of figure, as to remove all doubt that they belong to the same species, even though we place together two examples of very dissimilar aspect. The shell is rather thin, always very fragile, except at the umbones, which are not unfrequently the only portions preserved when the shelly beds are more than usually detrital in their character. The valves rarely occur in contact; but when this happens the ligament is preserved.

The subjoined proportions must be regarded as representing the median figure of the species. Height, 13 lines; lateral diameter, 15 lines; diameter through both the valves, 10 lines. It ranks as one of the most abundant of the bivalves in the Minchinhampton district, and ranges throughout the shelly beds. Named after J. G. Lowe, Esq., who has assiduously collected an interesting series of fossils from the middle Oolite.

*Localities.* Minchinhampton Common; Bisley Common.

CYPRINA TRAPEZIFORMIS, et var. SUBROTUNDA. Tab. XIII, fig. 5, 5a, c.

VENUS TRAPEZIFORMIS, Roemer. Verst. Nordd. Oolith., t. 7, fig. 14.

*Testá orbiculato-subtrapeziformi, convexo-planá; antice rotundatá; postice subproductá, angulo acuto carinato-depresso; umbonibus anticis incurvis.*

Shell orbicular or subtrapeziform, moderately convex; anterior side rounded; posterior side somewhat produced, forming a depressed angle; umbones anterior, incurved.

This small species occurs abundantly throughout the shelly beds of the formation at Minchinhampton, with the valves disunited. When well preserved, its surface exhibits concentric, irregular, and very fine striations; it is shorter and more convex than *C. Loweana*. The form which we have designated as a variety has greater convexity, and the posterior side has not the angulated outline of the typical form.

Dimensions of this variety: height, 8 lines; lateral diameter, 9 lines; diameter through both the valves, 7 lines. Another line added to the lateral diameter will represent the typical form.

*Localities.* Minchinhampton Common; Bisley Common.

CYPRINA JURENSIS, Goldf., sp. Tab. XIII, fig. 3.

VENUS JURENSIS, Goldfuss. Petref., p. 245, t. 150, fig. 17.

*Testá parvâ suborbiculari; umbonibus medianis minutis; lunulâ ovatâ; areâ lanceolatâ.*

Shell small, smooth, nearly orbicular, rather depressed; umbones mesial and small; lunule ovate; area lanceolate.

The nucleus figured by Goldfuss from the Coral Rag of Nattheim, agrees in form with our little species, and they are probably identical.

Height,  $5\frac{1}{2}$  lines; lateral diameter, 7 lines.

*Localities.* Bisley Common, at Eastcombs, and Bussage.

CYPRINA DEPRESSIUSCULA. Tab. XIII, fig. 4.

*Testá suborbiculari, laevi, convexo-planá; umbonibus medianis parvis acutis; lunulá subexcavatá; margine postico curvato; basi arcuatá.*

Shell suborbicular, smooth, and slightly convex; umbones mesial, small, and pointed; lunule slightly excavated; hinge margin curved; base regularly rounded.

The smooth, rather depressed surface, the mesial pointed umbones, and absence of all angularity in the outline, are the leading characters of this shell, which appears to be rare. Its position is the soft shelly Oolite, about the middle of the shelly beds.

Height, 8 lines; lateral diameter,  $9\frac{1}{2}$  lines.

*Locality.* Minchinhampton Common.

CYPRINA NUCIFORMIS, *Lycett*. Tab. XII, fig. 4.

CYPRINA NUCIFORMIS, *Lycett*. Journ. Geol. Soc., 1853, vol. 9, p. 340, pl. 14, fig. 3.

*Testá subnuciformi, convexá; umbonibus magnis curvatis; marginibus rotundis; latere postico angulo obtuso obliquo; lunulá excavatá.*

Shell subcordiform or nut-shaped, convex; umbones large, prominent, and curved forwards; margins of the valves rounded; posterior side with an oblique, obtuse angle; lunule large, slightly excavated.

A very convex species, with large umbones, less oblique and more convex than *Venus trapeziformis*, Roemer.

Height and length equal; convexity of the valves one third less.

*Localities and position.* In Gloucestershire it occurs in the middle portion of the Inferior Oolite; our specimens are from the Great Oolite of Ponton, in Lincolnshire.

*Genus*—TANCREDIA. *Lycett*, 1850.

TANCREDIA, *Lycett*. Ann. Nat. Hist., 1850, p. 407.

HETTANGIA, *Terquem*, 1852. *Buvignier*. Statistique Géologique, Minéralogique et Paléontologique du Département de la Meuse; Atlas, p. 14.

— *Terquem*, Bull. Soc. Géol. de France, 10. p. 368.

*Gen. Char.* Shell equivalve, subæquilateral, smooth, somewhat flattened, transverse, donaciform; umbones nearly mesial, small, contiguous, flattened; anterior extremity usually pointed; no lunule; posterior side more convex, with an oblique angle more or less conspicuous, the extremity truncated, and more or less gaping; ligament short, external, placed in a small depression; basal margin lengthened, curved, or elliptical;

hinge with an obtuse cardinal tooth in each valve, which is received into a corresponding cavity in the other valve; occasionally in the right valve there is a small anterior, and in the left a small posterior accessory tooth or prominence upon the margin of the cavity; lateral teeth are large, posterior, and approximate in each valve, that of the left valve projecting and received into a depression of the tooth or callosity of the other valve. Muscular impressions oval; pallial impressions simple, faintly marked. There is no lunule; the margin of the right valve anterior to the umbo forms a thickened projecting fold, which covers the tooth of the other valve, and is received into a corresponding receding portion of the margin of that valve; so that the junction of the valves anterior to the umbo has a sinuous flexure.

In the typical species, *T. donaciformis*, which is an Inferior Oolite shell, the lateral teeth are remarkably large; and they are nearly equally conspicuous in the *Hettangia Deshayesca*, Terquem, and *H. Broliensis*, from the Lias of the Moselle and the Meuse, figured by M. Buvignier; but the other Liassic species described by that author, coincide in their dental characters more nearly with our Great Oolite species of this genus. In these, the shells are more delicate, the hinges are smaller and more elongated, the teeth are less projecting, and the cardinal tooth of the left valve is elongated forwards, somewhat upon the anterior border; the lateral teeth are variable in their prominence, and not uncommonly the tooth of the right valve is indistinct or obsolete. When the valves are much flattened, the posterior aperture becomes narrow or not distinguishable. The figure of *Tancredia* varies according as the anterior or posterior sides are the most produced; but more commonly the posterior side is the shorter one, and when it is much truncated, the figure then nearly resembles that of the recent *Donaces*. All the species at present known are destitute of ornament; they are smooth, and exhibit but indistinctly the lines of growth. The margins of the valves are smooth, and, independently of the posterior aperture, there is a general irregularity in the form of the margins, so that they are not close fitting along their extent. In England, *Tancredia* has only hitherto been noticed in the lower Oolitic rocks. M. Buvignier and M. Terquem have recognised eleven species in the Lias of France, and Dr. Dunker one from Halberstadt. To the geologist a knowledge of this form is of importance, as the species appear to be very limited in their vertical range, and hitherto it has not been discovered that any one of them is common to two formations. The profuseness with which *T. brevis* is distributed in the shelly beds of the Minchinhampton Great Oolite, and the young of *T. donaciformis* in the shelly freestone of the Leckhampton Inferior Oolite, is such, that each becomes the most abundant bivalve of their respective localities; the valves are always disunited, and casts are unknown.

In looking to the affinities of this genus, we discover a near approximation—almost an actual passage—into a group of Oolitic forms, which are as yet very imperfectly known, and of which *Corbis lævis*, Sow., and *Corbis depressa*, Buvig., are examples. Three other species have been obtained from the Inferior Oolite of the Cotteswolds, and one from the Coralline Oolite of Malton. In all of these a smooth surface is coincident with a

compressed, elongated figure, and a hinge, the dentition of which differs materially from that of the better known forms of Corbis. The shells, likewise, are rather thin, the margins not toothed, and the posterior side is always the larger of the two.

TANCREdia TRUNCATA, *Lycett*. Tab. XIII, fig. 11.

TANCREdia TRUNCATA, *Lycett*. Ann. and Mag. Nat. Hist., 1850, pl. 11, f. 10.

*Testá subtrigóná, ovato-cuneatá; umbonibus posticis; latere postico, brevi, truncato; antico elongato, margine superiore ejusdem recto, obliquè-declivi; margine inferiore subrecto.*

Shell subtrigonal, or ovately wedge-shaped; umbones posterior; posterior side short, truncated; anterior side elongated, its superior margin straight, sloping obliquely downwards, the extremity rounded; basal margin nearly straight.

The short posterior side slopes suddenly downwards, it is bounded by an obscure angle or ridge.

Height,  $6\frac{1}{2}$  lines; length, 13 lines; diameter through both the valves, 5 lines. Its position is the shelly beds of the Great Oolite, in which it is somewhat rare.

*Localities.* Minchinhampton and Bisley Commons.

TANCREdia BREVIS. Tab. XIII, fig. 8.

*Testá parvâ subtrigónâ; umbonibus submedianis; latere postico brevi, angulo producto; marginibus acuminatis, margine inferiore elliptico.*

Shell small, subtrigonal; umbones submesial, depressed; posterior side sloping obliquely, and having a prominent angle, which passes obliquely from the umbo to the postero-inferior border; margin of the valves pointed at both extremities, the inferior margin curved elliptically.

Compared with *T. axiniformis* this species is much more short and convex, and it always forms a prominent angle upon the posterior side, posterior to which the surface is flattened, or even slightly excavated, the extremities of the valves being pointed. In its geological range it accompanies the two other species; it is everywhere common, and certain layers of soft shelly Oolite beneath the planking of Minchinhampton Common are entirely covered with its valves; undoubtedly it is the most abundant bivalve in the district.

Length,  $7\frac{1}{2}$  lines; height,  $4\frac{1}{2}$  lines.

The *Tancredia donaciformis*, *Lycett*, 'Ann. and Mag. Nat. Hist.,' 1850, vol. vi, pl. xi, fig. 8, approximates so nearly to our species that it is necessary to discriminate between the two forms. The *T. donaciformis* is more lengthened, the umbones are mesial, but the anterior side is more attenuated, its marginal slope being slightly concave, and its extremity more pointed, so that the posterior side appears to be larger than the other; it occurs in the shelly free stone of the Inferior Oolite, Leckhampton Hill, in an abundance rivalling our Great Oolite species.

*Locality.* The whole of the Minchinhampton district.

TANCREDIS CURTANSATA, *Phil.*, sp. Tab. XIII, fig. 7a, b.

CORBULA CURTANSATA, *Phil.* Geol. York., 1, t. 3, f. 27.

*Testá ovato-elongatá; umbonibus medianis, parvis; antice compressá, acuminatá, postice convexá; margine antico obliquè declivi concavo; basi ellipticá curvatá.*

Shell ovately elongated; umbones small, mesial; anterior side compressed, its extremity pointed; posterior side moderately convex, its margin slightly rounded; antero-superior border obliquely sloping and concave; base elliptically curved.

This is the largest of the Great Oolite species of this genus, it is moderately abundant in the shelly beds; specimens vary much in the convexity of the valves.

Height, 10 lines; length, 15 lines; diameter through the valves, 7 lines.

*Localities.* Minchinhampton, in the Great Oolite; Malton, in the Coralline Oolite.

TANCREDIS AXINIFORMIS, *Phil.*, sp. Tab. XIII, fig. 6a, b.

NUCULA AXINIFORMIS, *Phillips.* Geol. York., 1, t. 11, f. 13.

TANCREDIS EXTENSA, *Lycett.* Ann. and Mag. Nat. Hist., 1850, pl. 2, f. 9.

— AXINIFORMIS, *Morris.* Journ. Geol. Soc., 1853, v. 9, p. 341, pl. 14, f. 4.

*Testá ovato-trigoná elongatá, convexo planá; umbonibus medianis; latere postico convexiore, angulo oblique subacuto; margine anteriore et posteriore rectis, obliquè declivibus; basi ellipticá curvatá.*

Shell ovately trigonal, elongated, rather depressed, pointed at the extremities; umbones mesial, depressed, small, and pointed; the posterior side the more convex, with a subacute oblique angle separating a space posterior to it, which is slightly concave; anterior and posterior margins straight, and sloping obliquely downwards; lower margin curved elliptically.

Specimens of this species present a considerable amount of variability in their figure; those from Lincolnshire are usually more convex posteriorly, and have the angle more acute, the space posterior to it being somewhat concave; the Minchinhampton specimens are flatter, the umbones scarcely so much elevated, the posterior angle more obtuse, the space adjoining it being flattened. These differences at first induced us to regard the two as distinct species, and the first description of *T. extensa*, published in the 'Annals of Nat. Hist.' for 1850, was deduced from Gloucestershire specimens, as compared with the acute angle and otherwise distinct figure given in the 'Geology of Yorkshire;' but an examination of numerous specimens, and more especially of those from Lincolnshire, have satisfied us that at the utmost, those of the North of England can only be considered as a variety of the more common form seen in Gloucestershire.

*Tancredia angulata* is a higher shell, with a shorter posterior, and more attenuated anterior side.

Length, 11 lines; height, 6 lines.

*Geological position and localities.* *T. axiniformis* occurs in the Inferior Oolite of Yorkshire, and in the Great Oolite of Ponton, Lincolnshire, and of Minchinhampton, in the shelly beds.

TANCREDIA PLANATA. Tab. XIII, fig. 10*a, b*.

*Testá ovatá, planatá; umbonibus submedianis parvis acuminatis; antice compressá; postice plano-converá; margine postico obliquè-curvato; antico recto obliquè declivi; basi curvatá.*

Shell ovate, flattened; umbones nearly mesial, small, and acute; anterior side compressed, its extremity rounded; posterior side rather more convex; the posterior margin has an oblique curvature; the anterior margin is straight, and slopes obliquely; the base is curved elliptically.

A delicate, smooth, and flattened shell, the anterior extremity of which is much less acuminate, and the posterior less truncated than is usual in this genus. It is moderately abundant in the shelly beds of the formation, and varies considerably both in its outline and degree of convexity.

Height, 9 lines; length, 13 lines.

*Localities.* Minchinhampton and Bisley Commons.

TANCREDIA ANGULATA, *Lycett*. Tab. XIII, fig. 9*a, b*.

TANCREDIA ANGULATA, *Lycett*. Journ. Geol. Soc., 1853, vol. 9, p. 341, pl. 14, f. 5.

*Testá ovato-trigoná; umbonibus elatis, medianis, acutis; latere antico compresso; postico angulum obliquum formante; margine cardinali brevi, recto horizontali; basi curvatá.*

Shell ovately subtrigonal; umbones elevated, mesial, acute; anterior side compressed; posterior side with an oblique angle separating a flattened posterior portion; ligamental margin short, horizontal; basal margin with a considerable curvature.

This species, which is smaller than *T. curtansata*, is distinguished from that form by the flattened and angulated posterior side, and by the more erect and acute umbones; and from the Inferior Oolite *T. donaciformis*, by the more erect, acute umbones, and more lengthened form; the basal margin has also a more considerable curvature.

Height, 9 lines; length, 14 lines.

*Geological position and localities.* Ponton, Lincolnshire, and Minchinhampton; at both places in the Great Oolite.

#### CORBIS. Sub-genus—CORBICELLA.

*Testá inornatá, ovato-elongatá, subcompressá; umbonibus plerumque antemedianis depressis, contiguís; margine superiore elongato, subrecto, obliquo; ligamento externo*

*brevi ; basi ellipticâ curvatâ. Cardo dentibus cardinalibus duobus subtrigonis, et laminâ testaceâ posticâ, elongatâ, cum dente laterali postico remoto obtuso in utrâque valvâ. Impressiones musculares ut in Corbis ; valvium marginibus interni integri.*

Shell destitute of ornament, ovately elongated, rather compressed ; umbones contiguous and depressed, and placed a little anterior to the middle of the valves ; superior or ligamental border lengthened, nearly straight, and sloping obliquely ; ligament external, short, and contained in a groove ; basal margin curved elliptically. Hinge with two cardinal subtrigonal teeth, a lengthened posterior lamina, and a remote, obtuse, posterior lateral tooth in each valve. Muscular impressions as in *Corbis*, the anterior impression being small and oval, the posterior larger and more rounded, the inner margins of the valves plain. Casts of a large Inferior Oolite species exhibit an oblique anterior sulcation, which passes downwards immediately behind the anterior impression, and is obliterated towards the lower border ; this sulcus indicates the presence of an oblique rib upon the interior of each of the valves. The character of the hinge is shown in Tab. XII. fig. 13, 13a.

This group of shells, of which the Great Oolite contains a small species, consists of six or more Oolitic species, which all agree in their characteristic features ; their external aspect is sufficiently distinct from the typical group of *Corbis*, their surface is destitute of ornament, and the greater development of the posterior side indicates a distinction, which is confirmed by an examination of the hinge characters. The anterior lateral tooth is always absent, and the internal ridge, which in the typical form of *Corbis* descends from it anterior to the impression, passes in our group posterior to the impression, as is clearly shown by the groove in the cast. The stratigraphical position of the known species of this group is as follows. The Inferior Oolite of the Cotteswolds has two species ; our Great Oolite shell is the third ; a large elongated shell in the Coralline Oolite of Malton is the fourth ; the *Corbis depressa*, Desh., from the department of the Meuse, is the fifth ; and another, probably, is the *Psammobia Moreana*, Buvig., 'Pal. de la Meuse' Atlas, pl. iv, figs. 8—10 ; the latter form nearly resembling our Great Oolite species. The number of these species, and their general accordance in form, surface, and hinge characters, indicate a distinctness worthy of consideration. M. Buvignier, in his description of *Corbis depressa*, Desh., 'Pal. de la Meuse,' p. 12, has, we believe, correctly indicated the natural affinities of this group ; he regards it as establishing a passage between *Corbis* and *Hettangia* (*Tancredia*). Adopting this view, we would likewise place it intermediate to *Corbis* and the latter genus.

CORBIS (CORBICELLA) BATHONICA. Tab. XIII, fig. 14.

*Testâ ovato-elongatâ subcompressâ tenui ; umbonibus antemedianis ; latere antico rotundo, postico elongato, subtruncato, angulo obliquo obtuso ; basi curvatâ ; lateribus plicis incrementi paucis, irregularibus.*

Shell ovately elongated, rather compressed, the test thin ; umbones small, anterior to

the middle of the valves; anterior side rounded, posterior side elongated, the superior border being nearly straight, and sloping obliquely, the posterior extremity is rather truncated; an obscure and obtuse angle descends obliquely upon the posterior side; the sides of the shell have a few irregular folds of growth; the base is curved elliptically.

A delicate species, which varies considerably in its figure, and in the distinctness of its lines of growth; the dental characters are minute, and can rarely be exposed. It is nearly allied to a much larger and more stout Inferior Oolite species, in which the figure is usually more elongated, and the dental characters much more conspicuous. The relative dimensions in this shell vary so much that measurements have little value, but the umbones are always anterior to the middle of the valves. It occurs rather commonly throughout the shelly beds of the formation.

*Locality.* Minchinhampton.

#### QUENSTEDTIA.

*Testá æquivalvi, subæquilaterá, oblongá et planatá; umbonibus parvis, contiguís, compressis; ligamento externo; forcéá ligamenti angustá et elongatá; margine antico rotundo, postico compresso, subquadrato; superficie plicis longitudinalibus plus minusve instructá. Cardio dente cardinali unicá obtusá et transversá in valvá sinistrá, valva dextra fossá cardinali unicá transversá sub umbone sitá. Impressiones musculares postici rotundi, antici elongati et sinuati; impressio pallealis sinu brevi.*

Shell equivalve, subequilateral, oblong, and flattened; umbones small, contiguous, and compressed; ligament external, placed in a narrow elongated groove; anterior margin rounder; posterior margin compressed and subquadrate; the surface with irregular longitudinal plications more or less conspicuous. Hinge with one obtuse transverse cardinal tooth in the left valve, which is received into a corresponding pit in the opposite valve. Posterior muscular impressions rounded; anterior impression elongated and sinuated; siphonal scar with a small sinus. (Tab. XV, fig. 12. Tab. IX, fig. 4a. b.)

A genus approximated to Psammobia in the general figure of the valves, but distinguished from it in the position of the ligament, which is placed in a narrow fossa, instead of upon the raised nymphen plate of Psammobia; the single transverse tooth is another distinctive feature, and reminds us of Myoconcha; the sinus in the siphonal scar is much smaller than in Psammobia or Sanguinolaria.

QUENSTEDTIA OBLITA, var. Tab. IX, fig. 4, 4a, b., and Tab. XV, fig. 12.

*Syn.* PULLASTRA OBLITA, Phillips. Geol. York., 1, tab. 11, fig. 15.

*Testá ovato-oblongá compressá; umbonibus parvis medianis; antice rotundatá, postice compressá, subtruncatá, angulo obliquo declivi obtuso; latere postico plicis longitudinalibus irregularibus.*

Shell ovately oblong, compressed; umbones small, mesial, compressed, rather pointed; shell with the sides anteriorly rounded, posteriorly compressed, truncated, and forming an obtuse angle, which slopes obliquely downwards to the infero-posterior extremity; the posterior side has some irregular longitudinal plications, which disappear towards the middle of the shell.

The Great Oolite variety of this species is many times smaller than that of the Inferior Oolite, and it is rather more elongated, but it presents no real specific difference. The test is delicate.

This shell was referred to Pullastra, by Professor Phillips, from its external form only, and we believe that only one or two specimens were at his disposal. The figure in the 'Geology of Yorkshire,' unaccompanied by any description, appears to have misled Professor Quenstedt, who has figured the hinge of *Tancredia donaciformis*, Lyc., for his exemplification of *Q. oblita*. The *Panopæa Lebrunæa*, Buvig. 'Paléont. de la Meuse,' Atlas, pl. 7, fig. 6, 7, is nearly allied to our species, but is more elongated and less truncated posteriorly. The arrangement of the longitudinal ridges is very similar.

*Localities and position.* *Quenstedtia oblita* has occurred in the Inferior Oolite of Blue Wick, Yorkshire, and in the upper portion of the same formation at Rodborough Hill, Cotteswolds. The shelly Great Oolite of Minchinhampton Common has afforded our smaller variety; but the species appears to be rare at each locality.

*Dimensions.* Our largest Inferior Oolite specimen has a length of  $2\frac{1}{2}$  inches, and is  $1\frac{3}{8}$  inch in height, the greater number of specimens being about 2 inches in length; but the Great Oolite variety is only 6 lines in length, and 3 in height.

#### CORBULA, Brug. 1791.

Shell ovately trigonal, convex, inequivalve, the left valve being the smaller; a single cardinal tooth in each valve projecting, that of the left valve being compressed; there is likewise a pit in each valve contiguous to the tooth, which is destined to receive the ligament; the ligament is internal, inserted in the pit of the right valve, and in the cavity of the tooth of the left valve; depression of the mantle posteriorly angulated.

CORBULA INVOLUTA, Goldf. Tab. IX, fig. 6.

CORBULA INVOLUTA, Goldfuss. Petref., t. 151, f. 14.

„ STRIATA, Buckman. Geol. of Cheltenham, 2d edit. p. 97, pl. 3, f. 4.

*Testá parvâ convexâ, concentrice striatâ; umbonibus submedianis; latere postico rostrato, carinato, excavato; latere antico rotundato.*

Shell small, convex, concentrically striated; umbones nearly mesial; posterior side rostrated and slightly excavated; anterior side rounded.

An acute angle passes from the umbo obliquely backwards, separating a narrow area from the remainder of the surface; the concentric striæ are continued upon the flattened posterior area. This little shell is one of the most abundant in the formation; its concentric striæ are very frequently not preserved, and the valves are never found in opposition. The test is thick, and the characters of the hinge strongly marked.

Height, 3 lines; lateral diameter, 4 lines.

*Localities.* Minchinhampton Common, and Eyeford, Gloucestershire.

NEERA IBBETSONI. Tab. XII, fig. 9.

NEERA IBBETSONI, *Morris*. Geol. Soc. Journ., 1853, p. 341, pl. 14, fig. 6.

*Testâ subglobosâ, pyriformi, subæquivalvi, striatâ; umbonibus magnis submedianis; latere antico rotundo; postico producto, bicarinato, subrostrato; basi curvato; lateribus plicis regularibus inconspicuis; nucleo lævi.*

Shell subglobose, pyriform, subequivalve, striated; umbones large, rounded, mesial; anterior side rounded; posterior side produced, attenuated, and bicarinated, the anterior carina acute; lower margin curved; the sides with regular, slightly marked plications; nucleus smooth.

A very convex and nearly equivalve shell, with an acutely marked angle upon the posterior attenuated slope; anterior side rounded. The nucleus has the posterior extremity compressed, short, and truncated. It ranks as one of the most rare productions of the Lincolnshire beds.

Height, 9 lines; length, 11 lines; diameter through both the valves, 8 lines.

*Localities.* Danes Hill; Essendine, and Ketton quarries. Dedicated to Capt. L. B. Ibbetson, F.R.S., in whose company it was first noticed, much compressed in the clays above the Ketton Oolite.

#### Family—MYADÆ.

Previously to stating our views upon this extensive family, we desire to record our obligations to Agassiz, for his important work, 'Etudes Critiques,' which exhibits a large amount of patient research, of critical sagacity, and original views. The author has, however, candidly admitted that his work is imperfect in certain of the details—that facts are sometimes wanting or insufficiently known, and consequently that the genera proposed by him are probably not all of equal value. The subject, indeed, is connected with difficulties of more than one kind, and of such a nature, that subsequent observers might be expected to differ in their estimates of the value of the several generic distinctions proposed by M. Agassiz, and might even determine to discard some of them altogether. The length of time which has elapsed since the publication of the 'Etudes Critiques' has been sufficient for the accumulation of many additional facts tending to render our theoretical

views more precise and conclusive. The considerable opportunities afforded us for investigation, and the interest with which we have long viewed this obscure family, combine to impart to our language a degree of confidence which we should not otherwise venture to express. The numerous and varied series of these fossil forms all agree in having their test of great tenuity and delicacy, so that not unfrequently we are reduced to derive our knowledge from an examination of their internal casts; or, should the tests be preserved, it is very rarely that we are enabled to expose sufficiently their hinges or other internal characters. In this family we also lose another important aid in the determination of the genera, inasmuch as the dental characters of the hinge are reduced almost to nothing, the Oolitic Myadæ being altogether destitute of hinge teeth, properly so called, and possessing only a shelly lamina, variously modified in form, and extending internally posteriorly to the umbones, and supporting the cushion of the ligament; but this lamina never forms an elevated nymphal collosity, as in certain recent genera.

At the period of the publication of the 'Etudes Critiques,' the internal hinge characters of certain of the genera had not been fully ascertained. They were known only from appearances upon the external moulds or internal casts; and in more than one instance the author was induced to rely upon the observations of others, although these were opposed to his own experience. These uncertainties have since gradually been diminished, not, indeed, without the perpetration of other errors, and it will be found that in the present Monograph, we have been induced to adopt certain modifications of, and other changes in, several of the genera, although our exemplifications of the Myadæ constitute only a subordinate position in the testacea of the Great Oolite.

In discriminating the fossil Myadæ, it will be found that certain features, which are only of subordinate importance in shells of the symmetrical acephala, generally become the principal, and, indeed, sole aids upon which we have to rely; fortunately, however, these features, which are included in the terms *general figure and ornaments of the surface*, acquire in the Myadæ an increased degree of importance from their invariable persistence and distinctness of design, in a similar ratio that the hinges and their characters have degenerated in value.

The thin flexible coverings of the fossil Myadæ have a much more intimate relation to the forms of the enclosed Mollusks than is possessed by the shells of other families of bivalves; the shell does not form a mere compact rigid cyst, but rather a thin sheath or tegument, which conforms to the figure of the Mollusk itself, and varies somewhat according to the circumstances in which the animal was placed with relation to the surrounding ground, or to contiguous organisms. The entire family have large, irregular, longitudinal folds or ridges, which are, for the most part, but imperfectly distinguishable upon the internal casts. The genera of Myadæ, proposed by Agassiz, are the following. Pholadomya, Homomya, Corimya, Ceromya, Ceromya, Goniomya, Myopsis, Pleuromya, Arcomya, Platymya, and Mactromya. Pholadomya had previously been established, and remains uncontroverted.

*Corimya* is the *Thracia* of Leach, the latter author having the priority; *Tellina incerta*, Thurm., is an English Oolitic example.

*Mactromya* has, we believe, justly been dismembered by D'Orbigny, the forms which Agassiz regarded as typical having been separated from the *Myadæ* to constitute the genus *Unicardium* of the former author, and has been previously described in this Monograph. Three remaining species, referred by Agassiz to *Mactromya*, are too imperfectly known to justify us in pronouncing their true position with any confidence.

*Ceromya* may now be considered as sufficiently established; the hinge characters, which were imperfectly known to Agassiz, have been fully described by M. Buvignier, 'Bull. Geol. Soc. Fr.,' 1850; for, although the shell upon which the latter author founded his description is a *Gresslya*, we have ascertained that the hinges of the two genera are altogether alike. M. d'Orbigny ('Prodrome de Paléontologie') and M. Buvignier ('Paléont. Dep. de la Meuse') have merged *Gresslya* in *Ceromya*, but we consider that Agassiz was justified in regarding them as distinct, their figures are essentially different; the *Ceromyæ* are all ventricose, with incurved equal subspiral umbones; they are equivalve, for although there is much irregularity in this respect, and occasional inequality of the valves, these variations are altogether accidental, and resulted probably from the position which the Mollusk occupied in the ground, or its proximity to other bodies; their surface has regular ridges which are not altogether smooth, they are concentric, or in other species they take an oblique direction; or, again, they suddenly change their direction and are reflected after the manner of the *Goniomyæ*. *Gresslya*, on the contrary, is never perfectly equivalve, the right valve being always larger, and its umbo higher than the other; the form is much more compressed, the umbones more pointed, the surface is destitute of the peculiar ridges of *Ceromya*, but possesses a different kind of ornamentation; the outer layer consists of a very delicate pellucid semicorneous test, with densely arranged radiating lines of granules, the lines usually slightly undulate, and the granules, which are regular, are densely arranged, and so minute as scarcely to be visible to the unassisted eye. M. Agassiz was not acquainted with this fact, which we have ascertained by an examination of a large number of examples in a good state of preservation. *Ceromya* has been shown by M. d'Orbigny to be identical with *Anatina*, of which it possessed the usual vertical fissure beneath the umbones and the granulated surface; but the aspect of the two forms differs in other particulars, for Oolitic species are compressed, the posterior side is remarkably elongated, and the anterior side has large longitudinal ridges. These features indicate a distinction which we regard as of subgeneric value. We would, therefore, place *Ceromya* as a sub-genus of *Anatina*.

*Goniomya* is a form which we believe to be entitled to a separate generic rank, notwithstanding M. d'Orbigny and M. Buvignier have reunited it to *Pholadomya*; the ridges upon the sides are strongly impressed upon the internal casts, and are very different from the costæ of *Pholadomya*; and it has, moreover, a granulated surface, the granules, as in *Gresslya*, being radiating and linear.

There yet remain a very numerous and varied series of the fossil Myadæ, which have been separated by Agassiz under the names of *Myopsis*, *Pleuromya*, *Arcomya*, *Platymya*, and *Homomya*. These forms are found in the Muschelkalk, and throughout all the Secondary rocks; one or more species likewise occur in the older Tertiary rocks of England. M. Agassiz believed that *Myopsis* was distinguished from the others by the presence of a tooth in the hinge (*vide* D'Orbigny), although he had never been able to detect its presence, and also by its possessing a surface ornamented by radiating lines of granules. We have been enabled to ascertain that the most abundant of the British Myopsides (*Mya dilata*, Phil.) is destitute of any cardinal tooth, and that the granulated surface, which M. Agassiz relied upon as distinguishing *Myopsis*, is possessed also in a manner more or less modified by *Arcomya*, *Platymya*, *Pleuromya*, and *Homomya*.

There remains, therefore, between these proposed genera little more than the distinction of figure; and even this feature, although sufficiently remarkable and distinct in certain selected typical species, approximates so nearly in others, that in very many instances it is only possible to separate them as distinct groups by an arbitrary and uncertain arrangement. The test of these shells is very thin, and a depression more or less distinct exists upon the anterior side of the valves, extending from the umbones to the inferior border.

The Myopsides are usually elongated posteriorly; their siphonal aperture is large, and their radiating lines of granules are distantly arranged, and large upon the posterior side: *Mya dilata*, Phil., is a well-known English example. *Arcomya* is more rhomboidal or subquadrate; the anterior side is compressed; the posterior has an oblique prominence: the siphonal aperture is elongated and narrow. *Pleuromya*, with more tumid umbones, has its superior border slightly concave, and the posterior third of the shell is attenuated with a small aperture. *Platymya* resembles *Myopsis*, except that the umbones are placed nearer to the middle of the valves; the figure is more compressed, and the siphonal aperture is small. *Homomya* resembles the more elongated of the Pholadomyas. The umbones are large and usually but little compressed; but, with this exception, there is nothing to distinguish the figure from one or other of the preceding types, inasmuch that M. Agassiz, in the absence of a knowledge of the test, was sometimes unable to allocate them to either of his proposed genera. Certain of the shells which Agassiz would refer to *Homomya* possess a feature which tends to approximate them to the true Pholadomyas, viz., the presence of a few faintly marked radiating costæ upon the umbones. These, however, are uncertain, and sometimes vanish altogether. Such species appear to form a true passage, connecting the more elongated Pholadomyas with the Panopæas. The granulated surface which distinguishes this great series of fossil Myadæ presents several modifications of character, and tends to separate more fully the several species. The first modification has the granules rather large, placed upon lines which are slightly elevated and distantly arranged: some of the larger Myopsides and *Arcomyæ* present examples. The second modification has the lines of granules distinct; but the granules are minute, and both these and the rows are very closely arranged: the *Pleuromyæ* have usually this

kind of surface. The third modification has the entire surface covered with granules so minute as to be nearly or altogether invisible to the unassisted eye. They are so dense that the linear arrangement cannot be recognised: the *Homomyæ* have this kind of surface. In the present state of our knowledge, it would not appear that the figure of the shell affords any certain guide to the character of the granules which adorn its surface, a general resemblance of form being sometimes coincident with a very different kind of surface, and in the fossil *Myadæ*, wherein the figures of the individuals present much variability, and consist more commonly only of casts, the presence of a small portion of the outer granulated tegument will in some instances serve as a sure guide to distinguish species for which the casts alone would not have sufficed. It is owing to the absence of the test that so many of the figures of the 'Etudes Critiques' of Agassiz afford only doubtful guides to the correct knowledge of the species.

The foregoing observations will prepare the reader for the conclusion at which we have arrived, viz., that *Myopsis*, *Pleuromya*, *Arcomya*, *Platymya*, and *Homomya* cannot claim to be regarded as distinct genera, and that it is very difficult, or perhaps not practically possible, even to separate them into so many sections or sub-genera. They seem rather to constitute a single very extensive and varied series of forms, which, although individually resembling in certain of their features either *Pholadomya* or *Panopæa*, are nevertheless sufficiently separated from both of these genera, and possess a generic entirety which is rather strengthened than otherwise by these resemblances.

The hinge exactly resembles that of *Pholadomya*, except that the subligamental lamina is more stout, and the test at that part of the shell is generally more thickened. It is therefore destitute of the sharp tooth of *Panopæa*; but even this feature is not without exceptions, for M. Buvignier has figured an Oolitic species, which has a distinct tooth, and we have ourselves discovered a tooth slightly defined in an Inferior Oolite shell, other examples of which present no trace of this feature.

The hinge then generally resembles that of *Pholadomya*, and some few species or rather individuals of these species, by possessing a few delicate radiating costæ upon the umbones, present another feature which tends to approximate them to the same genus. To *Panopæa* other examples are allied by the occasional presence of a projecting cardinal tooth, and by a universal flattening or depression upon the anterior third of the valves. The granulated surface, however, removes it equally from *Panopæa* and *Pholadomya*. In the figure of the muscular impressions we recognise a close resemblance to those of *Pholadomya*, the anterior impression being very narrow, pyriform, and so much elongated upwards as to reach nearly to the umbo. In *Panopæa* the figure of this impression is irregular and different. The siphonal flexure is always very great, whatever may be the figure of the posterior side of the shell. Briefly to recapitulate these analogies and differences: our group is allied to *Pholadomya*, in the features of the hinge and of the muscular impressions, but differs from it in the absence of costæ, in the presence of radiating lines of granules upon the surface, and in the vertical depressions upon the sides of the shell. It

resembles *Panopæa* in the depression upon the middle or anterior side, and by the presence of an occasional cardinal tooth in the hinge; but these affinities are neutralized by the differing figure of the anterior muscular impression, by the usually edentulous hinge, and by the granulated surface. We regard, therefore, *Myacites* (*Schlot.*) as a genus intermediate and connecting *Pholadomya* with *Panopæa*.

The genus *Myacites*, *Schlotheim*, was founded upon certain *Muschelkalk* shells, which belong to our great group of granulated *Myadæ*, and have that kind of figure which belongs to the *Pleuromyæ* and perhaps to the *Homomyæ* of Agassiz. *Schlotheim*, who had no knowledge either of the hinge or of the test, characterised his genus in the following terms:

“*Testa transversa, inæquilatera, subhians, obovata vel ovalis, ventricosa lævis, concentrice striata; umbones anteriores.*”

The meagreness and insufficiency of this description would render the genus valueless, in the absence of other and more precise knowledge; but as the *Muschelkalk* shells are well known, *Schlotheim* has a claim to priority in the generic designation, and as the five genera proposed by Agassiz must necessarily be referred to the same group, those of the latter author must be discarded as superfluous. Our arrangement of the fossil *Myadæ* will be as follows:

Pholadomya.					
Anatina, Sub-gen.	Cercomya	.	.	.	Genus, <i>Cercomya</i> , <i>Ag.</i>
Goniomya	.	.	.	.	„ <i>Goniomya</i> , <i>Ag.</i>
Ceromya	.	.	.	.	„ <i>Ceromya</i> , <i>Ag.</i>
Gresslya	.	.	.	.	„ <i>Gresslya</i> , <i>Ag.</i>
Thracia	.	.	.	.	„ <i>Coriomya</i> , <i>Ag.</i>
Myacites	Myopsis, <i>Pleuromya</i> , <i>Platymya</i> , <i>Arcomya</i> , and <i>Homomya</i> , <i>Ag.</i>				

#### GRESSLYA, *Ag.*

Shell ovate, rather compressed, very inequilateral, sub-equivalve; umbones anterior, contiguous, compressed, acute, and incurved; lunule excavated; anterior side convex, its border rounded; posterior side more attenuated, sometimes rostrated; superior border rather convex, sloping obliquely downwards; lower margin curved elliptically, borders of the valves close, or with a very small posterior aperture; ligament external, short; hinge line externally somewhat sinuous; the shell is not perfectly equivalve, the umbo of the right valve being a little higher in the other; the test is extremely delicate, with fine longitudinal plications, and with very densely arranged radiating rows of minute granules. Hinge edentulous, but having an elongated lamina in each valve, that of the left valve being inserted beneath the outer lamina of the other valve, as in a groove; there is also in the right valve an oblique internal rib, which extends posteriorly, and is only visible

upon the casts, a feature similar to that in *Ceromya*; the muscular impressions are very faintly marked, as is likewise the pallial impression, the flexure of which appears to be short. This genus, having been reunited to *Ceromya* by M. d'Orbigny, and M. Buvignier having figured and described the hinge of a *Gresslya*, named by him *Ceromya Deshayesi*, in a very complete manner, it has become necessary to institute a close comparison between the two generic forms, and to weigh carefully their affinities and differences.

1stly. *Form.* *Ceromya* is usually larger than *Gresslya*, and always more ventricose, the umbones are more prominent, those of *Ceromya* approaching to the form of *Isocardia*; *Gresslya*, with its acute umbones and more compressed figure, approaches to that of *Cardinia*; *Gresslya* is also very constantly slightly inæquivalve, the right valve exceeding the other in height; in *Ceromya* they are equal, and any irregularity of form which may sometimes occur to give the semblance of inequality in the valves is altogether accidental, and depends, apparently, upon the portion of the shell during its growth.

2dly. *Character of the Surface.* The sculptured surface of *Ceromya* is quite unlike that of any other of the *Myadæ*, the longitudinal grooves being more or less visible upon the casts, but the casts of *Gresslya* are smooth, and the granulated surface of the test is altogether different from that of *Ceromya*.

3dly. *Hinge Characters.* In *Ceromya*, as in *Gresslya*, the casts of the right valve exhibit a groove posterior to the umbones which has been impressed by a corresponding prominence or internal rib in that valve; in *Ceromya*, however, this groove is likewise visible upon the exterior of the test, but not in *Gresslya*; the internal hinge laminae are precisely alike in both genera; but this is a feature which in the fossil *Myadæ* has but little value in generic affinity or distinction. Whatever value the Palæontologist may be disposed to attach to the foregoing distinctions when viewed singly, it must, we think, be admitted that in the aggregate they are of considerable importance, and it is necessary to neglect none of them in forming a fair estimate of the two forms.

*Gresslya* was eminently gregarious, *Ceromya* not so, and for the most part it occurs much more sparingly; both lived in the same beds; the valves of *Ceromya* are frequently disunited, in *Gresslya* they are invariably in contact.

#### GRESSLYA CARDITÆFORMIS.

*Testâ ovato-depressâ; umbonibus prominentibus subplanis, latere antico producto rotundato, basi curvatâ, latere postico abrupte declivi, lineis incrementi paucis, irregularibus.*

Shell ovate, depressed; umbones prominent, rather compressed; anterior side produced and rounded; base curved; posterior side sloping abruptly; lines of growth few and distant.

This species possesses a general resemblance to *Gresslya Saussuri*, the *Venus Saussuri* of Brongniart and Goldfuss, but our shell has much less convexity; in both species the outline has a considerable resemblance to that of a *Venus*, but an examination of the hinge border has proved that it is edentulous.

The extreme tenuity of the test will account for its uniformly bad state of preservation and rareness. It occurs in a bed of soft shelly Oolite, which is situated about the middle of the shelly beds, and abounds with valves of *Tancredia*.

Length,  $2\frac{1}{4}$  inches; height,  $1\frac{3}{4}$  inches; diameter through both the valves, 7 lines.

*Locality.* Minchinhampton Common.

GRESSLYA PEREGRINA, var. ROSTRATA. Tab. X, fig. 7.

GRESSLYA ROSTRATA, *Agassiz*. Etud. Crit., t. 12 b, fig. 7, 8.

*Testá ovato cuneiformi, antice rotundatá, postice elongatá et acuminatá, basi subrectá.*

Shell ovate or somewhat cuneiform, rounded anteriorly, produced and pointed posteriorly; basal margin nearly straight.

The posterior side is somewhat compressed, forming an angle which extends obliquely from the umbones to the infero-posterior extremity, and there forms a pointed termination.

Height, 13 lines; lateral diameter, 19 lines; diameter through both the valves, 10 lines.

*Locality.* The southern side of Minchinhampton common, where small openings in the Stonesfield slate have afforded a few of the internal moulds. The genus never occurs in the shelly beds of the formation. Marls of the *Ostrea acuminata* (fuller's earth).

#### CEROMYA, *Ag.*

Shell cordiform or oval, very inequilateral, ventricose; umbones large, contiguous, incurved, involute; lunule excavated; anterior side convex, its border rounded; posterior side elongated and more flattened, its border either closed or having a slight aperture; ligament narrow, external. The surface is ornamented with one or more series of ridges and sulcations, which are longitudinal but not always concentric. In certain species a change in the direction of the ridges occurred at a certain period of the growth; substance of the test thin, almost papyraceous. Hinge edentulous; a lengthened lamina beneath the ligament in the left valve is received into a groove beneath the lamina of the opposite valve; there is also in the right valve an obliquely elongated posterior rib or internal depression, which, unlike that of *Gresslya*, is visible upon the surface of the test; muscular and pallial impressions rarely distinguishable; the anterior impression is pyriform, elongated upwards, and jagged or fringed irregularly, as in *Pholadomya* and *Gresslya*.

The variety of figure in *Ceromya* is very considerable; *Ceromya similis*, Lyc., in its elongated and compressed form approaching to that of *Gresslya*; the opposite figure is exemplified by *C. Bajociana*, D'Orbigny, which has the short ventricose aspect of *Isocardia*, between these there is every gradation of figure. *Ceromya* occurs rarely in the shelly beds of the Great Oolite, the valves being most commonly disunited, the tests are then preserved; in other situations without shelly detritus the valves are united, but the tests have disappeared.

## CEROMYA SYMONDSII. Tab. X, fig. 4a, b.

*Testá ovato-ventricosá, umbonibus magnis obliquis incurvis, latero antico convexo, postico subcompresso et elongato, basi curvato; plicis concentricis regularibus tenuibus non nunquam obsoletis.*

Shell ovately ventricose; umbones large, oblique, incurved; anterior side convex; posterior side rather compressed and elongated; base curved; concentric plications regular, very delicate, not unfrequently indistinct.

The general figure approaches *C. concentrica*, but it is more elongated, the umbones being more oblique and anterior; the concentric plications are more delicate, and are curved with a larger ellipse, they become undistinguishable near to the umbones. The substance of the test is extremely delicate, so that the fine plications are frequently visible upon the nucleus. The height of the shell is rather greater than the diameter through both the valves, and one fifth less than the longitudinal diameter, a slight aperture exists at the posterior extremity of the valves.

*Localities.* Nuclei occur rather commonly in the upper portion of the Great Oolite two miles east of Minchinhampton, but examples with the test preserved are very rare in the shelly beds of Minchinhampton Common; it also occurs in the Inferior Oolite of the same district.

The name in compliment to the Rev. W. S. Symonds, the Founder and President of the Malvern Naturalist's Field Club.

## CEROMYA UNDULATA. Tab. IX, fig. 1, 1a, b.

*Testá ovato-oblongá, tumidá; umbonibus anticis elongatis sub-terminalibus, involutis; latere antico angusto, brevissimo; postico lato, elongato; margine superiore convexo, interdum subundulato coriná dorsali oblique instructo; margine postico truncato; inferiore subrecto; lateribus lineis obliquis, excentricis crebris regularibus tenuissimis et undulatis; basi et margine postico plicis concentricis paucis irregularibus.*

Shell ovately oblong, tumid; umbones anterior, elongated, subterminal, and involute; anterior side narrow, very short; posterior side much wider and elongated; superior margin convex but irregular, sometimes rather undulated, a keel or angle passes obliquely from the umbones posteriorly nearly parallel to the superior border; the posterior margin is truncated, the lower margin straight. The sides of the shell are covered with densely arranged undulating fine lines, which are directed obliquely or excentrically from the umbones towards the wide posterior border, but do not reach it, being decussated by a few irregular concentric plications, which in advanced growth occupy the inferior and posterior margins of the valves; the supero-posterior angle separates the sides from a narrow posterior surface which is destitute of the excentric lines.

The tenuity of the test is extreme, and the fine radiating lines are usually visible upon the internal casts. The figure varies even more than is usual in the *Ceromyæ*. It has some resemblance to *Ceromya inflata*, Agassiz, but in that shell the character of the plications and their direction is altogether different, the size, likewise, never attains to that of our species.

In the greater number of specimens there is a wide depression, which extends from the region of the umbones to the inferior border, giving a compressed aspect to the anterior and inferior portion of the shell.

It occurs not unfrequently in the upper beds of the Great Oolite in beds of buff-coloured hard sandstone, situated about 95 feet above the fuller's earth, but always in the form of casts; in the shelly beds of the formation it occurs very rarely, the test is then preserved, and the valves disunited.

The form of *Ceromya undulata* presents the greatest possible contrast to *Gresslya*, but it is not easy to describe the distinctive features however striking.

Height, 17 lines; length, 20 lines; diameter through both the valves, 16 lines.

*Locality.* Minchinhampton.

CEROMYA PLICATA, *Ag.*, var. Tab. X, fig. 1*a*, *b*, fig. 2.

CEROMYA PLICATA, *Ag.* Etud. Cret. Myes., tab. 8*d*, 1842.

CARDITA V-COSTATA, *Buckman*. Geol. Chelt., 2d edit., p. 97, 1845.

*Testá ovato-oblongá, inflatá; umbonibus anticis depressis, involutis; latere antico brevissimo, tumido, truncato; latere postico lato, aperturá ejusdem magná et elongatá; margine superiore elato; inferiore subrecto et subundulato; lateribus fastigiis longitudinalibus crebris, subundulatis, superne acutangulo reflectis, (ætate progrediente) aliis concentricis decussatis; lateribus semel in medio sulcis radiantibus obscuris notatis.*

Shell ovately oblong, much inflated about the middle of the valves; umbones involute, anterior and depressed; anterior side very short, truncated and tumid; posterior side wide, its aperture large and lengthened; superior margin much elevated, and rather compressed; inferior margin lengthened, nearly straight, and sometimes slightly undulated; the sides of the valves with closely arranged longitudinal ridges, which slightly undulate, and towards the superior and posterior border are suddenly reflected anteriorly, forming acute angles; in progress of growth these reflected ridges are nearly effaced, and a second series of concentric ridges are formed, which cross the others obliquely towards the inferior border; lastly, in adult specimens, there may be distinguished a few obscure radiating sulcations about the middle of the valves. This shell, in the young condition, is a pretty species; the longitudinal ridges are very distinct, and their **V**-like angle towards the superior border is clearly defined; in adult shells the figure is more ventricose, the superior angle formed by the ridges is nearly effaced; the second, or concentric series of ridges, are formed, and some few radiating sulcations may be traced.

Collectors have very generally mistaken this species for *Ceromya excentrica*, a shell which is stated to occur abundantly in the upper or Portlandian Oolite of Switzerland, at Porrentroy, and in a similar parallel in the Jura of Soleure; *C. plicata* has not heretofore been adequately figured or described; the specimens figured by M. Agassiz represent adult and even aged shells, not well preserved, and in which the V-like angle of the ridges has nearly disappeared; his description is likewise more than usually meagre, and, in the absence of other evidence, the reader would be inclined to believe that the author had unnecessarily separated this shell from *C. excentrica*, but an examination of specimens in several stages of growth has convinced us of the propriety of the specific distinctions which are given in the 'Etudes Critiques'; the general figure is near to *C. excentrica*, except that in the adult forms the superior border is more compressed and elevated, and the posterior aperture is much larger; the change in the direction of the ridges upon the surface is not peculiar to *C. excentrica*, but occurs in other species of the same genus, neither is it a regular and constant feature in any species, or rather, we should say, that it is never found in the young condition of any species. All the specimens known are casts, the delicate and very perfect markings in young examples is a sufficient indication that the test must have been of extreme tenuity, and the partial obliteration of these features with advance of growth, evidences a corresponding change in the character of the test. In the specimen figured by Agassiz the angles of the reflected ridges are less acute.

*Dimensions.* Our largest specimen is in length  $3\frac{1}{4}$  inches; in height,  $2\frac{1}{2}$  inches; the diameter through both the valves being  $2\frac{1}{4}$  inches.

*Localities and position.* We have observed this species in the upper beds of the Inferior Oolite in Gloucestershire in the fuller's earth it has occurred over the Sapperton tunnel of the railway, from which deposit a specimen has kindly been forwarded to us by John Wilson, Esq., of Gloucester; we have ourselves obtained it from certain hard limestone beds near to the base of the Great Oolite in the Minchinhampton district, and Professor Buckman has recorded a specimen which he obtained in a bed of clay at Sevenhampton, which appears to be a little higher in the series; it is, however, rare at each of these localities.

CEROMYA CONCENTRICA, Sow., sp. Tab. X, fig. 3a, b.

ISOCARDIA CONCENTRICA, Sow. Min. Con., tab. 491, fig. 1.

— — Phil. Geol. York., 1, pl. 11, fig. 40.

— — Morris. Catal. Brit. Foss., 1st. Ed. p. 88. 1843.

*Testá ventricosá, ovato-obliquá, umbonibus magnis incurvis subanticis, latere antico convexo, postico subcompresso, basi curvato, lateribus fastigiis tenuibus concentricis regularibus crebris.*

Shell ventricose, ovately oblong; umbones large, incurved, anterior to the middle of

the valves; anterior side convex; posterior side more elongated and compressed; base curved; the sides of the shell with regular closely arranged concentric and fine ridges.

The umbones are prominent and elevated, more especially by comparison with *C. Symondsii* and *C. Northamptoniensis*, the two contemporaneous forms which most nearly approach to it; owing to this prominence, the superior border is rendered slightly concave. The valves fit closely, except at the posterior extremity, which has a slight aperture. The test is never preserved. It is liable to be confounded with a larger and magnificent Inferior Oolite species, which occurs in the neighbourhood of Stroud, and has the test preserved; this latter, which we believe to be the *Ceromya Bajociana* of D'Orbigny, 'Prodrome de Paléontologie,' p. 275, and, probably, the *Isocardia concentrica* of Phillips; in this shell the umbones are very large, and curve gracefully forwards; they are more median and less oblique; the general form is more ventricose, and the posterior side is shorter than in the true *Ceromya concentrica*.

*Ceromya concentrica* does not occur in the shelly beds of the Great Oolite, it occurs in the upper portion of the formation associated with *C. Symondsii* in the Minchinhampton district, and also near to Nymphsfield, it is also abundant in the Marl bed of the Inferior Oolite, and in the upper division of the same formation.

Dimensions of a Great Oolite specimen. Height, 16 lines; length, 20 lines; diameter through both the valves, 14 lines.

*Localities.* The neighbourhood to the east of Minchinhampton, and at Nymphsfield, in the Great Oolite; the escarpment of the Cotswolds generally in the Inferior Oolite.

#### CEROMYA SIMILIS. Tab. XII, fig. 12.

CEROMYA SIMILIS, *Lycett.* Geol. Soc. Journ., 1853, p. 340, pl. 14, fig. 2.

*Testa ovato-oblonga, convexa; umbonibus anticis incurvis; latere antico brevissimo, convexo, postico elongato mediocriter attenuato; margine superiori et inferiori parallelis, subrectis; striis concentricis magnis regularibus et crebris.*

Shell oblong, elongated, convex; umbones anterior, incurved, anterior side convex, very short, its margin rounded; posterior side elongated, superior and inferior borders nearly parallel, horizontal, and slightly curved; the lunule is excavated; the sides of the valves have regular, strongly impressed, and closely arranged longitudinal striations, which nearly vanish as they approach the superior border.

The form of this elegant species is intermediate between *Ceromya concentrica* and *C. excentrica*, some examples approaching more nearly to the former, others to the latter shell, the striations are strongly marked, rather larger than in *C. concentrica*, and there exists a slight vertical depression upon the middle of the valves; the umbones are rather depressed, scarcely rising higher than the elongated superior border.

Height, 15 lines; length, 22 lines; diameter through both the valves, 14 lines.

*Locality.* Ponton, in the shelly beds; also in the lower strata of Stamford, Morcot, &c.

THRACIA, *Leach*.CORIMYA, *Agassiz*.

Shell subtrigonal, inequivalve, inequilateral, rather flattened; cardinal area distinctly marked, the hinge margin forming a sudden declivity posterior to the umbones; the area is separated from the sides by a carina more or less visible; the left valve is always smaller than the right, its umbo is flatter or less elevated; the surface has concentric plications more or less prominent; the substance of the test is extremely thin, more especially in the smaller valve; the valves do not gape, or but very slightly, and the hinge is destitute of teeth. From *Tellina* it is distinguished by the absence of teeth, and by its wanting the lateral flexion which distinguishes that genus.

THRACIA STUDERI. *Ag. sp.*

TELLINA INCERTA, *Thurm*, Roemer, Verst. Nordd. Ool., p. 121, tab. 8, fig. 7.

— — — — — *Goldf.* Petref., tab. 146, fig. 14.

CORIMYA STUDERI, *Ag.* Etud. Crit., p. 267, tab. 35.

*Testá subæquivalvi obovatá, convexá-planá, antice convexá; margine curvato; latere postico abrupte compresso; umbonibus medianis inæqualibus, compressis; lateribus plicis concentricis irregularibus.*

Shell subequivalve obovate, moderately convex, anterior side convex, its margin curved, posterior side compressed, attenuated, and separated from the other portion of the shell by an obtuse angle (sometimes imperfectly defined). The umbones are mesial and contiguous, but not prominent nor large, the margins of the valves are close fitting; the sides of the valves have numerous irregular concentric plications.

This species is more elongated, and has the posterior side more produced than our other Great Oolite species; the Cornbrash specimens have considerable variety of figure, with respect to their height and to the distinctness of the posterior angle, irrespective of accidental compression.

*Geological position and localities.* In England it occurs in the Cornbrash of Wilts, and in the Great Oolite of Northamptonshire. M. Agassiz states that it is abundant in the Portlandian beds of Porrentruy, Jura. Goldfuss records it in the upper oolite of Hanover.

## THRACIA CURTANSATA. Tab. XIII, fig. 1a, b.

*Testá convexo-planá, subtrigóná, subæquilaterali, et lævigatá; umbonibus submedianis, inæqualibus incurvis; latere postico abbreviato; valvâ sinistrâ subplaná, umbone parvo; plicis concentricis tenuissimis irregularibus.*

Shell depressed but convex, subtrigonal, nearly equilateral and smooth; umbones nearly mesial, unequal, and incurved; posterior side short; left valve compressed, its umbo small; surface with concentric, closely arranged, very fine, and irregular plications.

The surface is very smooth, the posterior side is scarcely so much attenuated as is usual in this genus, and the cardinal area is very obscurely defined. The general figure approaches the *Corinya tenuistriata* of Agassiz, but that shell has a smaller longitudinal diameter, and the umbones are not so nearly mesial. It would appear to be very rare, but has occurred both in the lower or shelly, and upper portions of the Great Oolite.

*Locality.* Minchinhampton.

### MYACITES, *Schlot.*

*Syn.* MYOPSIS, *Ag.* PLEUROMYA, *Ag.* ARCOMYA, *Ag.*  
 PLATYMA, *Ag.* HOMOMYA, *Ag.*  
 PANOPÆA, sp. *Buvignier.* PANOPÆA, sp. *D'Orbigny.*

Shell elongated, umbones anterior to the middle of the valves, contiguous, depressed, anterior border rounded, posterior border either rounded or truncated, both extremities gaping, sometimes equally so, or the posterior aperture is the more expanded, and sometimes slightly reflected; a depression more or less distinct extends from the umbones to the inferior border; ligament external and short; test delicate, with irregular longitudinal plications, and ornamented with a pellucid outer tegument, having granules disposed in radiating lines. Hinge without teeth, with an elongated horizontal thickened plate, which extends posteriorly to the umbones, and supports the ligament; muscular impressions usually indistinct, but resembling those of *Pholadomya*, pallial impression with a very large posterior flexure.

Under the comprehensive term *Myacites*, we arrange a very extensive series of forms which have been referred to *Amphidesma*, *Lutraria*, *Sanguinolaria*, *Myopsis*, *Arcomya*, *Pleuromya*, *Homomya*, and *Platymya*; commencing in the Muschelkalk, their numbers increased in the Lias, and they continued to hold a very prominent position throughout the oolitic and lower portion of the Cretaceous rocks.

From others of the *Myadæ* which have granulated surfaces, as *Gresslya*, *Goniomya*, and *Anatina*, they are distinguished by features which will be found under those genera.

We regard *Myacites* as a form which connects *Panopæa* with *Pholadomya*, by means of the more elongated forms of the latter species, and more especially by the hinge, which differs from *Pholadomya* solely by the greater thickness and strength of the former.

MYACITES VEZELAYI. *Lajoie*, Sp. Tab. XI, fig. 5, 5a.

*Syn.*

MYA VEZELAYI, *D'Archiac.* Mem. Soc. Geol. Fr., vol. v, tab. 24, fig. 4.  
 HOMOMYA GIBBOSA, *Ag.* Etud. Cret. Més., pl. 18.

*Testá nucleo elongato, umbonibus parvis anticis depressis, latere antico brevissimo, compresso, postico ventricoso, aperturá ejusdem valde elongatá, margine superiore concavo, inferiore curvato; lateribus plicis longitudinalibus magnis et irregularibus.*

Shell with the nucleus elongated, ventricose about the middle portion, and compressed towards the two extremities; umbones anterior, rather small, and depressed; posterior aperture of moderate breadth, but very much lengthened upon the superior margin, which is concave; the inferior margin is curved and nearly parallel to the superior, it has a narrow antero-basal aperture. The sides of the valves have large irregular longitudinal plications, and near to the umbones are some traces of a few radiating lines or costæ.

The aspect of this species is so much compressed from above, and tumid laterally, that the diameter through both the valves exceeds the height of the shell, and exceeds half its length; there is a superficial depression which extends downwards obliquely to the middle of the lower border, and coincides with the extent of the basal hiatus; the figure altogether is more ventricose and depressed than any other example of *Homomya* hitherto figured. M. Agassiz appears to have mistaken this species for *H. gibbosa*, the *Lutraria gibbosa* of the 'Min. Con.,' tab. 42 and 211; but the latter shell differs from it very considerably in figure, it is less depressed, has much larger umbones, is less ventricose in its middle portion, is destitute of the flattening of the anterior side, and likewise of the large longitudinal plications of *H. Vezelayi*.

We are not aware that the test of *M. Vezelayi* has ever been found preserved, the prominence of the plication indicates that it was very thin; we have not seen any traces of the muscular or palleal impressions.

*Localities and position.* It is abundant in the clays of the fuller's earth throughout the Cotteswolds, and we have obtained several specimens a little higher in beds of hard sandstone, near to the base of the Great Oolite, on the southern side of Minchinhampton common, associated with several other of the *Myadæ*.

#### MYACITES CRASSIUSCULUS. Tab. IX, fig. 3.

*Testá crassá, ovato-elongatá, antice et postice subcompressá, in medio ventricosá, umbonibus anticis subcompressis, latere antico brevi, margine rotundo; latere postico elongato, aperturá angustá, sed elongatá; margine superiori et inferiori subrectis et parallelis; lateribus plicis longitudinalibus crebris irregularibus; areá ligamenti magná, latá.*

Shell thick, ovately elongated, umbones anterior, moderately large, and compressed laterally; anterior side short and compressed, its margin rounded; posterior side elongated and attenuated, its aperture narrow and elongated upwards, the middle portion of the shell obliquely ventricose; superior and inferior borders parallel, nearly straight and horizontal; the cardinal area is large and distinctly circumscribed; the surface has closely arranged irregular longitudinal plications. The internal surface of the left valve has a curved projecting rib placed a little anterior to and beneath the umbo.

From *Maetra gibbosa*, Sow., this species is distinguished by the less elevated and compressed umbones, by the more straight and horizontal superior and inferior borders, and more especially by the very marked depression of the anterior side, which in *M. gibbosa* is convex. The test upon the anterior side and near to the umbones has a considerable degree of thickness; the rib of the left valve deeply indents the cast. The surface of the test, although identical in character with that of other species of *Myacites*, has never exhibited any distinct portion of granulated surface; had the granules been large, they could scarcely have failed to have been preserved equally with the surfaces of other species in the same bed. Indications of a few radiating lines, near to the umbones, are sometimes obscurely visible upon the test.

Dimensions of a small Great Oolite specimen. Height,  $1\frac{1}{4}$  inch, length,  $2\frac{1}{2}$  inches, diameter through both the valves, 1 inch; but the examples from the Inferior Oolite of the Cotteswolds are not uncommonly more than double these dimensions.

*Geological position and localities.* Ponton, Lincolnshire, in the Great Oolite; Rodboro'-hill, near Stroud, in the gryphite grit of the Inferior Oolite; at the latter locality the test is preserved; it also occurs not uncommonly in the form of casts throughout the Cotteswolds, in the same stratum; but it has usually been confounded with *Maetra gibbosa*, Sow., a shell whose test is rarely preserved, and which does not occur so low as the gryphite grit.

MYACITES CALCEIFORMIS, *Phil.* sp. Tab. XI, fig. 2.

MYA MARGARITIFERA, *Young and Bird.* Geol. York. Coast, pl. 7, fig. 2.

MYA CALCEIFORMIS, *Phil.* Geol. York., 1, t. 11, fig. 3.

*Testá elongatá, compressá, antice subconvexá, postice compressá et attenuatá, costá unicá obscurá ab umbone ad basin instructá, lateribus plicis longitudinalibus irregularibus, testá delicatissima, granulis radiantibus crebris minutis.*

Shell elongated, somewhat compressed; umbones acute, anterior to the middle of the valves; anterior side rather convex, its margin rounded, and the aperture narrow; posterior side compressed, lengthened, and somewhat pointed, its aperture small; superior margin sloping obliquely, nearly straight; inferior margin nearly straight; a single obscure elevation extends from the umbo to the inferior border, and there is, occasionally, posterior to it, a wide superficial depression; the longitudinal plications are numerous, fine, and irregular; the test is of extreme tenuity, and covered with lines of very minute radiating granules.

Specimens are usually destitute of the delicate test, but well preserved portions of it are occasionally found. It is nearly allied to *Myopsis marginata*, Ag., 'Etud. Crit. Moll.,' tab. 30, fig. 1, 2, but the species of Agassiz has a shorter anterior side, less rounded, and the convexity of the valves is more considerable; it is also higher and shorter than the

*Panopæa longa*, Buvig., 'Géol. de la Meuse, Atlas,' pl. 7, fig. 1, 3, to which, in other respects, it has a general resemblance.

The *Arcomya calceiformis*, Ag., 'Etud. Crit. Myes,' p. 176, tab. 9, fig. 7, 9, from the ferruginous Oolite of Moutiers, is a different species of the same group or sub-genus, and must be distinguished from our shell, which has the priority of name.

Height, 21 lines; length, 43 lines; diameter through both the valves, 14 lines.

*Position and localities.* The geological range of this species is considerable; in the Cotteswolds it occurs in the upper beds of the Inferior Oolite, in the fullers' earth, also in hard pale coloured sandstone near to the base of the Great Oolite; it occurs also in the Cornbrash of Chippenham, Malmesbury, and Cirencester; and at the latter three localities it is not uncommon. Professor Phillips records it in the Inferior Oolite of Blue Wick, and in the Kelloway rock of Scarborough.

MYACITES DILATUS, *Phil.* sp. Tab. X, fig. 5 *a, b*.

MYA DILATA, *Phil.* Geol. York., 1, tab. 11, fig. 4.

— — *Morris.* Catal. Brit. Foss., p. 92.

SANGUINOLARIA (?) DILATA, *Buckman and Strickland.* Geol. Chelt., pl. 6, fig. 1.

PANOPÆA DILATATA, *D'Orb.* Prodr. de Paleont., 10 etag. No. 216.

*Testá elongatá, anticè compressá, posticè subcylindricá, dilatá et truncatá; umbonibus antemedianis, parvis, compressis; aperturá anticá angustá; posticá magná supernè elongatá; margine superiori concavo, inferiore subrecto; lateribus plicis irregularibus magnis, angulo postico flecto; superficie granulis regularibus serialibus radiantibus dispositis.*

Shell elongated, anterior side compressed, posterior side nearly cylindrical, dilated and truncated at the extremity; umbones anterior to the middle of the valves, small, and compressed; anterior aperture narrow; posterior aperture large, suborbicular, but extending along the superior border almost to the ligament; superior border concave; inferior border nearly straight; the sides of the shell with a few large irregular longitudinal plications, which are bent upwards posteriorly at a considerable angle; the radiating lines of granules are rather large, and most conspicuous upon the posterior side.

The compressed anterior side of the shell is strikingly contrasted with the posterior expansion. Much variation exists in the proportions of its posterior elongation, and the latter border is sometimes reflected, the more aged specimens being the most elongated: the figure in the 'Geology of Cheltenham' represents the most shortened phase of form. The Great Oolite specimens are small; they have not occurred in the shelly beds, but in some imperfectly slaty deposits near to the base of the formation. The species also occurs in the fullers' earth, and in the upper portion of the Inferior Oolite, the latter rock producing by much the finer specimens. The punctations upon the granules appear to resemble those of the recent *Anatina hispidula*, and in like manner probably gave in-

sertion to as many corneous prickles; but we have not been able to trace this feature in all specimens.

The species most nearly allied are *Sanguinolaria? rotunda*, 'Geol. Chelt.,' pl. 6, fig. 3, and *Panopæa Guibaliana*, Buvignier, 'Géol. de la Meuse,' Atlas, pl. 8, fig. 3—5, but it is more trumpet-shaped and less elongated than the former, and less compressed than the latter.

*Localities.* Small excavations on the southern slope of Minchinhampton Common, in the Great Oolite; also in the Cotteswolds generally in the fullers' earth and Inferior Oolite; Glaizedale, Yorkshire.

MYACITES TERQUEMEA, *Buv. sp.* Tab. XII, fig. 6.

*Syn.* PLEUROMYA TENUISTRIA, *Ag.*, 1848, pl. 24.

PANOPEA TENUISTRIA, *D'Orb.*, 1850, Prod., 1, etag. 10, No. 242, (non *Buv.*)

Non LUTRARIA TENUISTRIATA, *Munst.* in *Goldf.*, pl. 153, fig. 2.

PANOPEA TERQUEMEA, *Buvig.* Paleont. Dep. de la Meuse, Atlas, p. 7.

*Testá obovatá, ventricosá; umbonibus subacutis, antemedianis, latere antico cordato-declivi, subdepresso, postice attenuato, aperturá parvá; plicis longitudinalibus tenuibus.*

Shell obovate, ventricose mesially; umbones rather acute, anterior to the middle of the valves; anterior side rather compressed, its border rounded; posterior side attenuated, its border slightly gaping; lower margin curved; longitudinal plications delicate.

The greatest diameter through the valves is a little anterior to the umbones, which gives a somewhat ventricose aspect to the figure.

Length, 16 lines; height, 10 lines; diameter through both the valves, 8 lines.

*Geological position and localities.* Our specimens are from the shelly beds of Minchinhampton Common, where it is very rare. Agassiz and Goldfuss have recorded it in the lower Oolitic rocks of France and Germany.

MYACITES UNIONIFORMIS. Tab. X, fig. 6.

*Testá tumidá, ovato-elongatá; umbonibus magnis, subcompressis; margine antico et postico rotundo; margine superiori concavo, lateribus lævigatis; sulco lato superficiali ab umbone ad marginem inferiorem producto.*

Shell tumid, ovately elongated; anterior side short; posterior side elongated; both anterior and posterior margins rounded; the posterior margin gapes but slightly; the hinge margin is elongated and concave; the area is lengthened, lanceolate, or narrow, and distinctly marked; the ventral margin is somewhat rounded; a wide, superficial depression extends from the umbo obliquely to the inferior border, and renders the anterior side nearly as much compressed as the posterior; the surface is smooth with faintly-marked irregular concentric plications.

The species which approach nearly to the present form, are the *Homomya gracilis* Agassiz, 'Etud. Crit.,' p. 162, tab. 20, f. 1—2, and *Mya Vezelayi* of D'Archiac, 'Mém. Soc. Geol. Fr.,' tom 5, pl. 25, fig. 4; but compared with the former shell, the figure is more compressed laterally and less elongated: the concavity of the superior border and larger umbones are other points of distinction. The species described by D'Archiac is very much more ventricose, and the umbones are more nearly terminal; the posterior aperture is likewise much more considerable.

Besides these there is another large undescribed species found in the upper division of the Inferior Oolite of the Cotteswolds, which resembles more nearly the present species than either of those before mentioned; but it is of thrice the linear dimensions, somewhat more elongated, and the superior border is not concave; the test and ligament, which are very well preserved, enable us to affirm its distinctness both from the Great Oolite species, and from *Homomya gracilis*, to which perhaps it is still more nearly allied. We possess two specimens, which occurred in the bed of soft shelly Oolite which overlies the Weatherstones: it would, therefore, appear to be very rare.

Height, 13 lines; longitudinal diameter, 26 lines; diameter through both the valves, 12 lines.

*Locality.* Minchinhampton Common.

#### MYACITES COMPRESSUS. Tab. XII, fig. 11.

*Testá ovato-rhomboideá; umbonibus prominentibus compressis; latere antico brevi, compresso, margine ejusdem subrecto declivi; latere posteriore medocre elongato, convexo, margine truncato; margine cardinali, subrecto, oblique, declivi; margine inferiore sinuato; lateribus sulco lato superficiali ab umbone margine inferiore producto.*

Shell ovately rhomboidal; umbones prominent and compressed; anterior side short, its margin nearly straight, sloping obliquely, and somewhat rostrated at the inferior extremity; posterior side moderately elongated, convex, its margin truncated; hinge border nearly straight, but sloping obliquely downwards; inferior margin sinuated; the sides with a wide and superficial depression directed from the umbones to the inferior margin.

The general contour of this species is remarkable for the anterior compression of the valves and of the umbones, which are prominent and very oblique; the height of the valves is so considerable, that it equals two thirds of the length. The straight anterior slope distinguishes it from *Arcomya Couloni*, Agassiz, which in other respects it nearly resembles. From our *M. tumidus* it is separated by the greater height of the valves and oblique slope of the hinge margin, which is also shorter; the anterior side is likewise more compressed, and its margin straighter. The granulated surface is not preserved in our specimen.

Height, 21 lines; length, 33 lines; diameter through both the valves, 16 lines.

*Locality.* Minchinhampton Common.

MYACITES TUMIDUS. Tab. IX, fig. 2 a, b.

*Testá subrhomboidéa, valvis in medio tumidá, latere antico brevi, compressiusculá; posticè elongato et truncato; margine ventrali subrecto et sinuosá; margine cardinali subrecto et horizontali; valvis lævigatis ligamentum magnum; lateribus lineis incremente confertis et irregularibus.*

Shell subrhomboidal, its middle portion tumid; anterior side short and compressed; posterior side elongated and somewhat truncated; ventral margin nearly straight and somewhat sinuous; hinge margin straight and almost horizontal; the valves smooth; ligament large; series of growth numerous and irregular.

An obtuse and very tumid surface extends obliquely from the umbones to the inferior and posterior border, which renders that part of the shell more convex than is usual in this genus. The anterior border slopes obliquely, but is somewhat rounded, and is moderately compressed. There can scarcely be said to be a hiatus at the anterior border, and the posterior border, which is somewhat truncated, has only a narrow opening. The entire form is short, as much so as *Arcomya brevis* of Agassiz. The shortness, together with the greater convexity of the middle portion of the valves, serves to distinguish it from *Arcomya quadrata* of the same author. This species of *Myacites* is represented by one specimen only: it has the ligament preserved, which is prominent, but not much lengthened.

Height, 16 lines; length laterally, 27 lines; greatest diameter through both the valves, 15 lines.

*Locality.* Minchinhampton Common.

#### ANATINA, Lam. CERCOMYA, Agassiz.

Shell elongated; umbones mesial, small, and depressed; anterior side rounded and produced; posterior side attenuated, having a lengthened and strongly defined posterior area, which has two longitudinal furrows upon its surface; no lunule. The surfaces of the valves are covered with large longitudinal ridges, which are strongly marked anteriorly, but are faintly traced posteriorly. There exists two depressions, more or less marked, upon the side of the shell, which, originating at the umbo, diverge obliquely, and are directed to the inferior border, causing that margin to undulate. These depressions, although superficial, influence the direction of the longitudinal folds, make them to deviate from their normal direction, and sometimes efface them altogether. The extremities of the valves gape, more especially at the posterior extremity.

M. Agassiz, judging from the contorted figure of the casts and the absence of anything like a fracture, thinks that the test must have possessed considerable flexibility.

M. d'Orbigny regards this group as identical with *Anatina*. He believes that the furrows upon the area are impressed by carinæ, which were destined to support the spoon-shaped processes of the hinge, and states that he has observed a chink or cleft at the summit of the umbo, left by the spoon-shaped processes and by the internal osselet of *Anatina*.

M. Agassiz admits that these features would indicate an affinity with *Anatina*, but directs attention to the elongated posterior side, to the cardinal area, and to the large longitudinal ridges upon the sides of the valves. These characters, which are wanting in *Anatina*, have induced him to retain his genus *Cercomya*.

One character of the genus has not been alluded to by M. Agassiz. It possesses an external semicorneous layer of test, which is furnished with radiating lines of tubercles, as in *Goniomya*, *Myacites*, *Gresslya*, and in the recent *Anatina*.

*Anatina* has not been found in the shelly beds of the Great Oolite. It occurs in beds near to the base of the formation, in pale argillaceous buff-coloured limestones and sandstone; it has also been found in the upper portion of the formation, associated with *Goniomya*.

M. Agassiz has sufficiently indicated the features which distinguish externally *Cercomya* from *Anatina*. The interiors of the valves of the fossil species have not been seen, but there is every reason to believe that they do not differ from *Anatina*.

*ANATINA PLICATELLA*. Tab. XI, fig. 6, 6 a.

*Testâ transverse-elongatâ, convexiusculâ, latere postico elongato; plicis concentricis crebris inconspicuis, postice obsoletis.*

Shell transversely elongated, convex; anterior side rather short, its upper border sloping obliquely from the umbo; posterior side more lengthened. Lateral longitudinal plications closely arranged, distinct upon the anterior side of the shell, but disappearing as they recede from it, so that the greater portion of the surface is nearly smooth. The very delicate plications and general convexity of the valves are sufficient to distinguish it from contemporaneous species.

Height, 13 lines; length, 25 lines; diameter through both the valves, 9 lines.

The figure nearly resembles that of *C. antica*, Agassiz, tab. 11a, fig. 14, 15; but the plications of that species are much larger and more continuous upon the sides.

*Locality*. It occurs very rarely in Stonesfield Slate, on the south side of Minchinhampton Common.

*ANATINA UNDULATA*, Sow. sp. Tab. XI, fig. 4.

*SANGUINOLARIA UNDULATA*, Sow. Min. Con., t. 548, f. 1, 2.

— — *Phil.* Geol. York., 1, t. 5, f. 1.

*Testá elongatá, convexá; umbonibus medianis, arcá magná, marginibus depressis, lateribus plicis longitudinalibus magnis, striis longitudinalibus densè impressis.*

Shell elongated convex; umbones mesial, area large, its margins faintly marked, the sides with very large regular plications, which are impressed with very fine densely arranged longitudinal striæ.

The length of the posterior side slightly exceeds the other; its extremity is slightly curved upwards, it is rarely preserved or perfectly represented upon the internal moulds; the lines of radiating tubercles cannot be distinguished upon the moulds. Height 9 lines; lateral diameter, 22 lines; diameter through both the valves, 8 lines.

*Locality.* Minchinhampton.

#### GONIOMYA, Ag.

Shell very thin, cylindrical and ventricose, or ovate and flattened, gaping at both the extremities, more especially the posterior extremity; anterior extremity rounded, posterior truncated; umbones mesial or a little anterior to the middle of the valves, contiguous and not very prominent; costæ large and curved, their anterior portions are directed obliquely backwards towards the inferior border, the posterior portions are directed in a similar manner forwards, so that the extremities of the costæ meet each other near to the middle of the shell at an angle more or less acute. The costæ are crossed and indented by closely-arranged concentric plications. The substance of the test has two layers, of which the outer one is semi-corneous, and is furnished with minute tubercles which are arranged in lines radiating from the umbones. Hinge edentulous; muscular impressions faintly marked; ligament external.

GONIOMYA LITTERATA, Sow. sp. Tab. XI, fig. 3.

GONIOMYA LITTERATA, *Agassiz.* Etud. Crit., p. 18, t. 16, f. 13-16.

MYA LITTERATA, Sow. Min. Con., t. 224, fig. 1.

LYSIANASSA LITTERATA, *Goldf.* Petref., t. 154, f. 8.

*Testá ovato-elongatá, convexá; umbonibus ante-medianis, margine cardinali subhorizontali aut concavá, margine antico obliquè declivi; costis anticis angustis subundatis; posticis magnis curvatis ultimis evanescentibus; plicis concentricis crebris decussatis; angulo costarum acuto, obliquo margine postico producto; margine inferiore subrecto.*

Shell ovately elongated, convex, umbones placed anterior to the middle of the valves, superior margin elongated, nearly horizontal, or even slightly concave, anterior margin sloping obliquely, inferior margin nearly straight; costæ anteriorly narrow, nearly straight, and slightly undulated, posterior costæ larger, curved but become obscure towards the extremity of the series; the costæ are decussated with closely arranged regular concentric plications; costal angle acute, and directed obliquely towards the infero-posterior border.

Our specimens agree more nearly with the figures of Agassiz than with those of Goldfuss; in the latter, the posterior side is not so much raised, so that the hinge margin slopes downwards in a manner similar to that of the anterior border, and the costal angle is not directed obliquely backwards; so that, judging from the figure alone, it might be regarded as a distinct species. Compared with *Goniomya v.—scripta*, our shell has much less prominent umbones, and the entire figure of the shell is more elongated or sub-cylindrical, the umbones being likewise more anterior; the posterior side of the shell is more lengthened, its superior margin being nearly horizontal. It is comparatively rare; we have obtained it in thin layers of pale or buff-coloured argillaceous limestone, about 100 feet above the fullers' earth, also in a much lower position, in a similar description of rock; but the genus has not been found in the shelly beds of the formation. Height and diameter through both valves equal, or half the longitudinal diameter.

*Locality.* Minchinhampton.

GONIOMYA HEMICOSTATA. Tab. XII, fig. 3.

*Testá ovato-clongatá, convexá; umbonibus ante-medianis magnis subcompressis, margine antico oblique-declivi, postico subhorizontali, concavo-hiante; superficie in medio oblique, depresso, costis crebris biangulatis aut trapeziformis instructis; costis inferioribus evanescentibus.*

Shell ovate, elongated, convex, gaping posteriorly with a considerable aperture; umbones anterior to the middle of the shell, large, elevated, but somewhat compressed; anterior border sloping obliquely downwards, posterior border lengthened nearly horizontal and concave; the middle portion of the shell has a wide depression which passes from the umbo directed slightly backwards and vanishing towards the inferior border; the superior and middle portion of the surface has numerous closely arranged costæ directed upon each side obliquely downwards towards the other, but connected with it by a horizontal straight costa; the lower half of the shell and the two extremities are altogether smooth. Outer or granulated layer of the test unknown.

A single well-preserved cast with the valves in contiguity is our only authority. The several features of this remarkable species clearly separate it from any other of the British *Goniomyæ*, the general figure with its elevated broad umbones, concave superior border, gaping and slightly reflected posterior extremity combined with the wide mesial depression, present no inconsiderable resemblance to a diminished figure of the great *Panopæa Aldrovandi*; the trapeziform direction of the costæ is governed by the mesial depression, and exists in those species only of the *Goniomyæ* in which this depression is well marked, thus in *Pholadomya trapezina*, Buv., *Lutraria trapezicostata*, Pusch., and *Goniomya inflata*, Ag. the horizontal costæ extend, with the depression, even to the lower border of the valve; in the present species they extend, with the depression, about half the depth of the valve, and in others, such as *G. Dubois*, Ag. *G. v.—scripta*, and *G. litterata*, the depression and

horizontal costæ only exist upon the umbo. Unfortunately our specimen has no portion of the granulated outer surface preserved.

Length, 19 lines ; height, 12 lines ; diameter through both the valves, about 8 lines.

*Locality*.—Blisworth, Northamptonshire.

#### PHOLADOMYA, Sow.

Shell thin, inæquilateral, ventricose, oval or oblong ; the borders of the valves more or less gaping, especially at the posterior extremity ; the umbones are large, contiguous, the apex of the one slightly impressing the other ; the ligament external, and placed in an oval depression, the surface is ornamented with costæ radiating from the umbones, which are regular and equal or irregular and unequal, smooth and rounded, or deeply notched and nodulous ; the entire surface has concentric plications which vary in their regularity, size, and prominence. The hinge is without teeth, but has an elongated lamina situated beneath the ligament.

The costæ are very commonly more numerous and prominent in the right valve than in the left.

The muscular impressions are faintly marked and cannot usually be distinguished ; the anterior impression is pyriform and elongated upwards towards the umbones, the posterior muscle is rounded, the syphonal scar has a considerable flexure.

PHOLADOMYA ACUTICOSTA, Sow. Tab. XIII, fig. 13.

PHOLADOMYA ACUTICOSTA, Sow. Min. Con., t. 546, f. 1, 2.

*Testâ ovato-elongatâ ; umbonibus crassis, antemedianis, latere antico brevi rotundato, posteriore producto angustato, costis elatis acutis, anticis magnis remotiusculis et irregularibus ; posticis numerosis crebris et tenuibus ; striis concentricis decussatis.*

Shell ovately elongated ; umbones thick, placed anterior to the middle of the valves ; anterior side short and rounded ; posterior side more produced and narrow ; costæ elevated, acute ; the anterior costæ large, rather remote, unequal, and placed at irregular intervals ; the costæ posteriorly are less elevated, numerous, and very closely arranged, gradually decreasing in distinctness towards the posterior extremity of the shell ; the costæ are decussated by concentric striations.

Our species is distinct from *Pholadomya acuticosta*, Roemer, tab. ix, fig. 15 ; and from Goldfuss, tab. cxxxvii, fig. 4 ; these, and likewise *P. multicastrata*, Agassiz, tab. ii, figs. 3, 4, have the anterior costæ regular and less prominent than in our species ; the *P. multicastrata* varies very considerably in its length, but our species is nearly uniform in figure.

*Localities*.—The upper beds of the Great Oolite, near Minchinhampton ; the slate of Stonesfield.

*PHOLADOMYA SOCIALIS.* Tab. XI, fig. 7, 7a.

*Testá nucleo mediocri magnitudini, ovato ventricosá, latere antico brevi et gibboso, lateré postico elongato, attenuato, et hiantē; umbonibus anticis magnis; area cardinali elongatá et planatá; marginibus anticis et posticis curvatis; plicis longitudinalibus magnis irregularibus; costalis radiantibus (circa 6) obscuris, aut evanescentibus.*

Shell with the nucleus moderately large, ovately ventricose; anterior side short and gibbose; posterior side elongated, attenuated, and gaping, with a lengthened but narrow aperture extending upon the superior and posterior border to its junction with the hinge border; upon the anterior border there is scarcely any perceptible aperture. The umbones, which are placed anteriorly, are moderately large; the cardinal area is lengthened and rather flattened; both the anterior and posterior extremities are rounded, and pass insensibly into the superior and inferior borders. The longitudinal plications are large and irregular, with deep furrows between them, but they become less prominent, and are almost lost as they approach the posterior extremity. The radiating little costæ are distinct only upon the umbones; they are about six in number, but not unfrequently they are absent altogether.

This species presents its full share of variations of figure, not unfrequently the anterior side appears compressed, and forms an obscure angle or rib, extending from the umbones to the inferior border; we have never seen the test preserved, but the nuclei display all the more delicate features of the shell; there are no traces of muscular or pallial impressions. It was eminently gregarious, and occurred in a bed of buff-coloured calcareous sandstone, situated nearly 100 feet above the fullers' earth, and associated with *Lucina Orbigniana*, *Ceromya Symondsii*, *Ceromya undulata*, and other characteristic forms.

The examination of a large number of specimens has enabled us to affirm its distinctness from the *P. laeviuscula*, Agassiz; a shell which is not so much elongated and attenuated posteriorly, and whose radiating costæ, though delicate, are visible over the sides of the shell, even to the inferior border. The large plications and more ventricose form distinguish it from *Pholadomya inornata*, Sow., 'Geol. Trans.' 2d ser., vol. v, pl. xxi; other species are more distantly allied.

*Localities.*—Small road side excavations two miles east of Minchinhampton; Blisworth, Northamptonshire.

*PHOLADOMYA OVULUM, Ag.* Tab. XIII, fig. 12.

*Testá ovatá; umbonibus magnis anticis subdepressis, latere antico brevi, convexo, margine rotundo, latere postico elongato et attenuato; aperturá parvâ, margine ligamenti obliquè declivi, inferiore curvato; lateribus costis radiantibus distantibus paucis, plicis longitudinalibus impressis.*

Shell ovately elongated; convex anteriorly, attenuated posteriorly; anterior side short, its border rounded; posterior side lengthened and attenuated, its aperture small; ligamental border nearly straight, sloping obliquely downwards, lower border curved; radiating costæ (about 7) distant, equal, spreading over nearly the whole of the shell, and rendered nodulous by some large longitudinal plications; the costæ of the left valve more prominent than those of the right. The convexity of the valves is considerable towards the anterior side; the umbones, though large, are but little elevated, and these features, together with the few distant and large knotted costæ, will serve to distinguish it from the Inferior Oolite *Pholadomya ovulum*, Ag., and *Pholadomya ovalis*, Sow., to both of which species it has some affinities; from the *Pholadomya Murchisoni* from Brora, it is distinguished by having a more elongated form, and much more distantly arranged costæ, so that only a small portion of the test is without them.

*Dimensions*.—Length, 2 inches; height,  $1\frac{1}{4}$  inch; diameter through both the valves, 1 inch.

*Geological position and localities*.—We are not aware that this species has occurred except in the Great Oolite of the North of England; the specimens forwarded to us are from Scarborough, and from the vicinity of Stamford.

PHOLADOMYA SEMANNI. Tab. XI, fig. 1, et Tab. XV, fig. 3.

*Testá ovato sub-compressá; umbonibus clatis magnis; latere antico brevi, rotundo; postico sub-compresso, brevi; aperturá angustá; costis radiantibus, 7-8 depressis, subrectis subæqualibus, et remotis; plicis longitudinalibus impressis.*

Shell ovate, rather compressed; umbones elevated and large; anterior side short, rounded, posterior side rather compressed and short, gaping, with a narrow aperture; radiating costæ 7-8 depressed, nearly straight, equal, regular, and remote; decussated but not much impressed by the longitudinal plications. The lateral diameter is somewhat less than the height, and exceeds considerably the diameter through both valves; but there is some variation in these proportions, the specimens which have the least convexity being usually less regularly ovate and rounded at their borders, so that they might, perhaps, be divided into two varieties.

From *P. solitaria* it is distinguished by the compressed posterior extremity, by the smaller convexity of the valves, and by the character of the costæ, which are less elevated and diverge so much more considerably that they nearly occupy the surface of the valves.

*Localities*.—Small openings or pits in the Great Oolite near to its base, and in the vicinity of the village of Avening. Scarborough, in the Great Oolite.

PHOLADOMYA SOLITARIA. Tab. XII, figs. 2, 5? var. of *P. producta*, Sow.

*Testá ovato-subglobosá; umbonibus magnis, latis, medianis; lateribus brevibus, posticè lævi, aperturá angustá; costis (7) perpendicularibus elatis approximatis, æqualibus, læviter impressis; plicis concentricis tenuibus.*

An ovately globose large species, with elevated median and broad umbones; the sides of the shell are short, the posterior side being destitute of costæ, its aperture is inconsiderable; the costæ (7 in number) are large, equal, but little divergent, and only slightly indented by the concentric plications, which latter are not conspicuous.

The height always exceeds the lateral diameter, and that through both the valves, the two latter measurements being nearly equal.

The combination of broad umbones, with equal little impressed perpendicular costæ only slightly radiating, together with the short but not truncated sides, will suffice to distinguish it from contemporaneous species.

*Geological position and localities.*—All our specimens are from the Minchinhampton district, they have been procured at several localities in oolitic sandstone a little higher than the fullers' earth, and obtained by well sinkings, they were unaccompanied by any other fossil.

PHOLADOMYA HERAULTI, Ag. Tab. XV, fig. 4, var. Tab. XII, fig. 1.

PHOLADOMYA MURCHISONI, Ag. Etud. Crit., p. 79, t. 4 c, f. 5, 7.

— — Roemer. Nordd. Ovl., p. 128, t. 15, f. 7.

— HERAULTI, Ag. Etud. Crit., Appendice, 1845.

*Testá ovato-globosá; umbonibus magnis anticis, serratis; areá cardinali magná, elongatá, latere postico modico hiante, latere antico brevi, costis (circa 9) obliquis, elevatis plicis longitudinalibus impressis; costá primá obscurá, costá secundá majorá et elevatá.*

Shell ovately globose; umbones large, anterior, and serrated; cardinal area large and depressed, posterior side gaping with a lengthened and moderately large aperture, anterior side short, slightly truncated; the radiating costæ, (usually 9 in number,) are large and elevated, the posterior ones are oblique; the first is only slightly marked, the second is the largest and most elevated; they are strongly impressed or rendered nodulous by the longitudinal plications; the two extremities of the shell are destitute of costæ.

This shell is more elevated, and the prominence of the second rib will suffice to separate it from *P. Murchisoni*, with which it has been confounded.

*Geological position and localities.*—*Pholadomya Heraulti* occurs not unfrequently in certain sandstone beds of the Great Oolite, in Gloucestershire; also at Blisworth, Northamptonshire, but the dimensions of these specimens are usually small; in the Inferior Oolite it appears to range throughout the extent of that formation in this country, in which it attains its full dimensions, and is very common.

*HINNITES ABJECTUS*, *Phil.*, sp. Tab. IX, fig. 7, and Tab. XIV, fig. 3.

*PECTEN ABJECTUS*, *Phil.* Geol. York., 1, t. 9, f. 37.

— — *Morris*, Cat. Brit. Foss., 1854, p. 175.

*Testá suborbiculari convexá; auriculá anticá productá lineatá, posticá subobsoletá; costellis rádiantibus numerosis (80 ad 100) irregularibus inæqualibus nodulosis et transversè striatis; interstitialibus interdum lineisque tenuissime notatis; valvâ propè mediam costellis 2 vel 3 elevatis acutis sed nodulosis instructá. Valvâ alterá planatá, delicatissimá lineis tenuissimis et undulatis non nunquam obsoletis.*

Shell, when not distorted, sub-orbicular and convex; the umbones small and depressed; the anterior auricle produced, the other usually indistinguishable; the radiating little costæ are very numerous, (from 80 to 100,) irregular, unequal, nodulous, and transversely striated; the interstitial spaces have likewise more minute costæ or lines, which are also nodulous, unequal in size, and uncertain in number; the auricle has these fine irregular lines; there will also constantly be noticed, towards the middle of the valve, two or three costæ, which are larger and more elevated than the others, they are acute but nodulous, and will alone at once serve to distinguish the species from *Hinnites velatus*, to which the general character of the surface offers a considerable resemblance. The figure of the latter and smaller species, however, is more fan-shaped or less orbicular and less convex. The other valve, which is very rarely seen, is extremely delicate and flattened, its surface has numerous very fine waved radiating lines, which are occasionally indistinct.

The numerous examples which we have obtained of this imperfectly known species exemplify its extreme irregularity of contour and convexity, not one is altogether regular; the test is thin, and there can be no doubt that it readily assumed the figure of any surface to which the flat valve was attached. In young examples the two or three more elevated costæ form a conspicuous feature which becomes less remarkable with the increase of the dimensions. Our largest example is upwards of four inches across.

*Geological position and localities.*—*Hinnites abjectus* is found in the Coralline Oolite of Malton, in the Great Oolite of Whitwell, and in the Inferior Oolite of Glaizedale, Yorkshire; it is also not uncommon in the upper division of the Inferior Oolite of Gloucestershire, but it has only occurred very rarely in the Great Oolite of the Minchinhampton district.

*PHOLAS. Linn. 1758.*

Shell elongated, sub-cylindrical, gaping at both the extremities; umbones incurved and contiguous. Hinge thickened, reflected to form a plate which covers the umbo in each valve; internally it has a curved spatulous tooth which projects in each valve.

PHOLAS OOLITICA. Tab. IX, fig. 21.

*Testá parvá ovatá, anticè convexá, posticè compressá, dorso in medio sulco profundo; costulis radiantibus acutis, anticis magnis distantibus, posticis crebris; plicis longitudinalibus regularibus imbricatis.*

Shell small, ovate, anterior side convex, posterior side rather compressed and attenuated; the dorsal surface with a deep mesial depressed line, which extends from the umbo to the inferior border; radiating costæ acute, elevated, and distant upon the anterior side, less elevated and more numerous posteriorly; they are indented by longitudinal plications, or lamellæ, which are regular and imbricated.

The test of this small species is very delicate; in adult specimens the umbones are placed one third from the anterior extremity; the convexity at that part is equal to the height, or about half of the length; young examples are shorter in proportion, and the mesial furrow is more strongly marked. The *Pholas crassa*, of Deslongchamps, 'Mém. Soc. Linn. de Normandie,' 1839, pl. ix, figs. 1, 3, 5, 7, has a similar or perhaps shorter figure; it has prominent but fewer imbricated folds, and it would appear to be destitute of the radiating costæ which ornament our species.

Length of our largest specimen, 10 lines; height and diameter through both the valves,  $5\frac{1}{2}$  lines.

*Localities.*—Minchinhampton and Bisley Commons, Gloucestershire.

## YORKSHIRE SHELLS.

OSTREA MARSHII, Sow. Tab. XIV, fig. 2, 2 a.

OSTREA DILUVIANA, Park. Org. Rem., 3, t. 15, f. 1.

— — Zeiten. Petref., t. 46, f. 1.

— MARSHII, Goldf. Petref., t. 73.

— — Roemer. Verst. Ool., p. 58.

— SULCIFERA, Phil. Geol. York., 1, t. 9, f. 35, junior.

*Testá subsolitariá subaquivalvi, ovato-trigoná, convexo-planá, crassá, plicis radiantibus, magnis inæqualibus acutis subimbricatis.* (Roemer.)

Shell subequivalve, either ovately oblong or fan-shaped; umbones small, terminal; the dorsal surface near to the umbones, has a mesial elevated smooth longitudinal ridge fringed upon each side with acute radiating plications, towards the lower border.

The central ridge divides into several very elevated acute costæ ; the interstitial spaces of which, form acute angles with them ; the substance of the test is thick. The *Ostrea sulcifera*, Phil., of which we have a specimen from Whitwell, Yorkshire, is only the germ of this large species, in which the central longitudinal smooth ridge has not divided to form the great posterior denticulate plications, the latter change having taken place at a subsequent period of its growth. In the adult condition the figure is sometimes a lengthened oval or oblong as in *O. sulcifera*, but, in other instances, which probably represent the final stage, the lower and larger plications spread out laterally, giving the shell a fan-shaped contour.

*Geological position and localities.*—We have received *O. Marshii* from the grey limestone of the Great Oolite near Scarborough ; we have collected it in the Cornbrash near to Malmesbury, and it occurs not uncommonly in the upper division of the Inferior Oolite in the Cotteswolds. *Ostrea sulcifera* is from the Great Oolite of Whitwell, Yorkshire.

GRYPHÆA MIMA, Phil. Tab. XIV, fig. 5.

GRYPHÆA MIMA, Phil. Geol. York., 1, t. 4, f. 6.

*Testá parvá obliquá, subglobosá, valvá convexá, rugis concentricis magnis ; areá adherenti magná, alterá convexo-planá.*

Shell small, oblique, subglobose, the larger valve convex, rugose, with large concentric folds ; the adherent surface subterminal, large ; the smaller valve more smooth, slightly convex.

More globose than *Ostrea rugosa*, Sow., and destitute of the marginal plications ; in other respects it much resembles that little species.

Height, 6 lines ; lateral diameter, 5 lines ; diameter through both the valves, 3 lines.

PECTEN DEMISSUS, Phil. Tab. XIV, fig. 7.

PECTEN DEMISSUS, Phil. Geol. York., 1, t. 6, f. 5.

— — Goldf. Pet., p. 74, t. 99, f. 2.

*Testá suborbiculari planatá ; umbonibus parvis acutis ; auriculis parvis æqualibus, valvá dextrá subplaná, valvá sinistrá convexio ; lateribus æqualibus marginibus rotundis ; superfici glabro lineis tenuissimis concentris, aliis subobsoletis radiantibus decussatis.*

Shell suborbicular, depressed, smooth and shining ; umbones small, acute ; auricles small, equal, rising slightly at their extremities, their outer borders curving obliquely downwards ; the margin of the valves slope downwards from the umbones nearly at an equal angle on each side, (about 40° to the axis of the valves) and the margins and base are regularly rounded ; the right valve has only a very slight convexity, and sometimes is traversed on each side obliquely by a slight furrow diverging from the umbo ; the left

valve is somewhat more convex; the shining surface of the valves discloses closely arranged, very delicate and unequal concentric lines, which are decussated by radiating lines, equally dense, but slightly waved and knotted when viewed under a magnifier; the auricles are densely striated. The auricles are so small, that the length of their superior border is less than a third of the height of the shell, the measurement of the lateral diameter being equal to the height. The specimen forwarded to us from Yorkshire, is only 14 lines across, and agrees with small examples from the Inferior Oolite of the Cotteswolds, in which latter rock the species attains to thrice this measurement.

*Geological position and localities.*—The Coralline Oolite of Malton, the Kelloway rock of Scarborough, the Cornbrash of Gristhorpe, the Great Oolite or grey limestone at Cloughton, and the bed called Trigonía Grit, in the Inferior Oolite of the Cotteswolds; it would appear to be abundant in each of these positions.

*PERNA RUGOSA*, Goldf. var. Tab. XIV, fig. 16, *et antea*, Tab. III, fig. 1.

*PERNA QUADRATA*, Phil. Geol. York., t. 9, f. 21, 22.

— — Goldf. Pet., t. 107, f. 12.

*Testá ovato-sigmoideá convexo-planá, in alam brevam productá; umbonibus acutis prominentibus; margine cardinali obliquo, canaliculis (8—12) plano concavis.* (Goldfuss.)

A subquadrate thick shell, with a lengthened and large series of hinge-grooves; the apex is pointed, and projects forwards, beneath which the anterior border is concave and in-crassated, the lower border is rounded, the posterior side of the shell is thin, and its border nearly straight. The surface has irregular concentric plications, which, however, are not very prominent.

Aged specimens acquire a very considerable degree of elongation, the opposite measurement upon the hinge border having but little increase, usually the figure is more quadrate or less sigmoidal than is represented by Goldfuss.

*Geological position and localities.*—In Yorkshire, *P. rugosa*, var. *quadrata* occurs in the grey limestone of the Scarborough Great Oolite; in the Cotteswolds, we have examples both from the lower and upper division of the Inferior Oolite.

*PTEROPERNA PLANA*. Tab. XIV, fig. 4.

*Testá obliquá, alatá, lineá cardinali recto elongato, postico valdè producto, valvis subæqualibus, depressis, inornatis; plicis concentricis irregularibus.*

Shell oblique, winged; umbones small, acute, curved forwards, and placed near to the anterior extremity of the hinge-line, above which they are scarcely elevated; hinge border lengthened, produced posteriorly into an extended and pointed wing; the valves are nearly equally flattened, the left valve being a little more convex than the other; they are

destitute of ornament, and have only irregular concentric plications. The anterior border beneath the short anterior wing is but little excavated, its aperture being very narrow; the lower side of the shell has not much obliquity, and its border is regularly rounded. Two ribs extend the length of hinge border immediately beneath it, as is usual in the *Pteropernæ*.

In size it equals the larger specimens of our *P. costatula*, but it is less oblique than that species: the left valve is much less convex, and the anterior sinuation is much less considerable; the umbones are smaller, and are much less elevated above the hinge border; the anterior auricle is nearly upon the same plane as the posterior, but in *P. costatula* it is directed obliquely downwards and forwards.

*Geological position and locality.*—The Grey Limestone of the Scarborough Great Oolite.

AVICULA MUNSTERI, Goldf. Tab. XIV, fig. 6.

*Testá (valva major) ovatá, obliquá, subconvexá, alá anticá acutá, posticá falciformi; costis radiantibus (3-4) acutis lineisque interstitialibus inæqualibus.*

Shell very oblique and convex, inequivalve; anterior auricle acute; posterior auricle more lengthened and falciform; the larger valve with regular equal radiating slightly knotted costæ (about 16 in number); in the middle of each interstitial space is an elevated line, with one or more delicate or more faintly marked, upon each side of it; the auricles are ornamented in a similar manner.

An elegant shell, with convex prominent umbones, narrow but well marked costæ, which slightly project at the inferior border.

*Geological position and locality.*—The Great Oolite of Scarborough, in dark grey argillaceous sandstone.

AVICULA BRAAMBURIENSIS, Sow. Tab. XV, fig. 7, var. fig. 6.

AVICULA BRAAMBURIENSIS, Sow. Geol. Trans. vol. ii, p. 323.

— BRAAMBURIENSIS, Phil. Geol. York., 1, t. 6, f. 6.

*Testá ovato obliqua, alá anticá rotundatá, posticá obtusiangulá, valvá majorá convexá, lineis radiantibus confertis minoribus alternis, interstiis angustis tegulatis. Valvá minorá convexo-planá lævigatá, lineis radiantis paucis distantibus subobsoletis.*

Shell ovately oblique; anterior auricle small, rounded, posterior auricle forming an obtuse angle; the larger valve convex, with numerous radiating lines, alternating with others which are smaller and indistinctly marked; the interstitial spaces narrow and indistinctly tegulated. The smaller valve slightly convex, smooth, with a few (7) radiating lines faintly marked.

The figure is remarkable for the smallness of the auricles and lengthened outline; the convexity is less than is usual in other of the ornamented aviculæ of the Lower Oolites.

It would appear to be nearly allied to a species which occurs in the Inferior Oolite of the Cotteswolds, from which it is distinguished by the shorter hinge border, less convex form, and fewer radiating costæ; it is not, however, quite certain that the Inferior Oolite shell may not be only a variety.

*Locality*.—Scarborough, in the bed of Grey Limestone.

PINNA CANCELLATA, *Bean*, MSS. Tab. XIII, fig. 20a, b.

*Testá ovato-lanceolatá, quadriquetrá, anticè convexá plicis magnis concentricis; posticè compressiusculá; striis transversis crebris et lineis radiantibus angustis nodosis distantibus decussatis.*

Shell ovately lanceolate, straight, quadriquetral, anterior side convex, with large densely arranged irregular, concentric plications; middle and posterior side more compressed, with fine irregular striations crossed by a few (about 12) longitudinal radiating knotted lines.

The single valve at our disposal does not exemplify the convexity and figure of the posterior aperture. It appears most nearly to resemble *Pinna Hartmanni*, Goldfuss, but it is more straight, with much fewer radiating lines, none of which are visible upon the anterior slope.

*Locality*.—Scarborough, in the Grey Limestone.

LIMA PUNCTATA, *Sow.*, sp. Tab. XV, fig. 9a, b.

PLAGIOSTOMA PUNCTATUM, *Sow.* Min. Con., t. 113, f. 1, 2.

LIMA PUNCTATA, *Goldf.* Petref., p. 81, t. 101, f. 2.

PLAGIOSTOMA PUNCTATUM, *Morris.* Catal., 1843, p. 117.

*Testá ovato-obliquá, convexo-planá; margine anteriore subrecto, elongato, abruptè truncato; lunulá excavatá; auriculis parvis inæqualibus; margine posteriore et inferiore rotundo; superficie lævi striis angustis, numerosis sub-flexuosis, densè punctatis.*

Shell ovately oblique, rather flattened; anterior margin nearly straight, truncated, elongated; lunule large, excavated; auricles small, unequal; the posterior and inferior borders of the valves regularly rounded; the surface is smooth, with very numerous, narrow, slightly waved, and densely punctated striations, crossed by a few irregular folds of growth.

The smooth shining surface, densely arranged striations which cover the entire surface of the shell, and flattened elongated form, readily serve to distinguish it from other species of the lower oolites.

*Localities*.—The specimen forwarded to us from Yorkshire is from the hard Grey Limestone of Scarborough. In the Cotteswolds it occurs abundantly in the Inferior Oolite; but it has not occurred in the Great Oolite of the latter district.

HINNITES ABJECTUS, *Phil.* Tab. XIV, fig. 3, *vide antea*, p. 125.

MYTILUS (MODIOLA) CUNEATUS, *Sow.* Tab. XIV, fig. 9.

MODIOLA CUNEATA, *Sow.* Min. Con., t. 248, f. 2.

— — *Phil.* Geol. York., 1, t. 5, f. 28.

*Testá ovato elongatá, convexá; umbonibus subterminalibus parvis curvatis, acutis; margine antico subsinuato; margine cardinali oblique declivi, curvato, dorso obtusè fornicato, anticè subdepresso, superficie; lineis concentricis tenuissimis irregularibus.*

Shell ovately elongated, convex; umbones nearly terminal, acute, and incurved; hinge margin sloping obliquely and curved; anterior margin nearly straight, but slightly sinuated; dorsal surface obtusely ridged, most elevated about the middle of the valve, forming a depressed surface anteriorly and obliquely to it; the surface with fine irregular concentric lines or striations.

The acute umbones, depressed and wedge-shaped anterior side, and slight obliquity of the entire form, serve to distinguish it from other species of the Lower Oolites.

*Geological position and localities.*—At Scarborough, in the Great Oolite; Somersetshire, in the Inferior Oolite.

MYTILUS (MODIOLA) LECKENBII. Tab. XIV, fig. 8.

*Testá ovato, arcuatá, convexá, acutá et obliquè fornicatá; anticè angusto posticè lato; umbonibus subterminalibus acutis; dorso fornicato, latere anteriore sulcato et sinuato; superficie striis tenuissimis, crebris, irregularibus.*

Shell curved, ovate; anterior extremity rounded but narrow, posterior extremity wide and curved obliquely; umbones nearly terminal and acute; dorsal surface with an elevated narrow ridge, anterior to which is a depressed and sinuated surface, the anterior border of which is much excavated, and its lower extremity rather pointed; the hinge margin is lengthened, sloping downwards obliquely, and but very slightly curved; the surface has closely arranged very fine concentric striations.

The great obliquity of the valves, the deeply sinuated anterior border, the pointed inferior extremity, and the flattened but raised posterior surface, will serve to distinguish it from *Mytilus (Modiola) bipartita*, to which its acute dorsal ridge presents a resemblance.

Length, 16 lines; opposite diameter, 8 lines; diameter through both the valves, 8 lines. The name is in complement to John Leckenby, Esq., of Scarborough, to whom we are indebted for the loan of the specimen.

*Geological position and locality.*—The Great Oolite of Scarborough, in a bed of hard grey ferrugino-micaceous sandstone.

MYTILUS (MODIOLA) UNGULATUS. Tab. IV, fig. 5 (*M. tumidus*).

M. UNGULATA, *Young and Bird*. Geol. Yorksh., pl. 7, f. 10.

M. TUMIDUS, *antea*, p. 37, pl. iv, f. 5.

This species has been previously figured under the name of *M. tumidus*, p. 37, but it is not distinct from the Yorkshire shell, and the latter name cannot therefore be retained.

CUCULLÆA CANCELLATA, *Phil.* Tab. XIV, fig. 12.

CUCULLÆA CANCELLATA, *Phil.* Geol. York., 1, t. 9, f. 24, t. 11, f. 44.

— OBLIQUA, *Lycett*. Ann. and Mag. Nat. Hist., 1850.

*Testá ovato-rhomboideá perobliquá ; umbonibus antemedianis contiguis, latere antico brevi, latere postico fornicato obliquè declivi et producto ; superficie lineis radiantibus minutis crebris aliis concentricis decussatis.*

Shell ovately rhomboidal, very oblique ; umbones placed near to the anterior extremity of the hinge line, and contiguous ; anterior side short, its margin rounded, posterior side with an oblique ridge, obtuse, and much elongated posteriorly ; the surface with very densely arranged, equal, regular, radiating lines, decussated by others concentric and equally densely arranged ; the lines are smooth, and the angles produced by the junction of the decussating lines have a punctated appearance ; upon the anterior side of the shell the radiating lines are rather less densely arranged.

The surface of this species has a considerable resemblance to *Cucullæa cucullata*, Goldfuss, but the latter shell is more convex and is less elongated, the area being likewise larger.

*Geological position and localities.*—At Scarborough, in the hard grey limestone of the Great Oolite ; in Gloucestershire, it occurs in the middle division of the Inferior Oolite.

UNICARDIUM GIBBOSUM. Tab. XIV, fig. 11.

*Testá ovato subglobosá ; umbonibus magnis medianis, curvatis ; margine cardinali brevi, subrecto, et subhorizontali ; marginibus aliis curvatis ; superficie plicis magnis irregularibus et inæqualibus.*

Shell ovately sub-globose ; umbones large, mesial, prominent, and curved forwards ; hinge margin short, nearly straight, and horizontal, its posterior extremity rather angulated, the other margins of the valves regularly rounded ; the surface is covered with large, irregular, and unequal concentric plications ; the thickness of the test is moderate.

The umbones are more nearly mesial than *U. depressum* and *U. impressum* ; they also project more, and therefore more nearly resemble *U. varicosum*, but the anterior side is

less produced, and the height is much less than in that shell; it is more nearly allied to, but is more oblique, than a large lias species which is not uncommon in Gloucestershire and Oxfordshire. Height and diameter through both the valves equal, lateral diameter one fourth more. The specimen forwarded to us from Yorkshire is much smaller than several which we have obtained in the Cotteswolds, in one of which the lateral diameter exceeds two inches.

*Geological position and localities.*—The Great Oolite of Scarborough; also in the middle or freestone beds of the Inferior Oolite in Gloucestershire; but it has not occurred in the Great Oolite of the same county.

UNICARDIUM DEPRESSUM, *Phil.* sp. Tab. XIV, fig. 10.

CORBULA DEPRESSA, *Phil.* Geol. York., 1, t. 9, f. 16.

*Testá ovato subglobosa; umbonibus magnis, subanticis incurvis, margine cardinali oblique declivi subrecto, basi et lateribus rotundis; plicis concentricis crebris irregularibus et inæqualibus.*

Shell ovately globose, oblique; umbones large, depressed, anterior to the middle of the valves; hinge border sloping obliquely downwards and nearly straight, its posterior extremity rounded; the margins of the valves, basal, anterior, and posterior, rounded; the general figure tumid, excepting near to the hinge border, where the surface is more depressed; the surface is covered with closely-arranged concentric plications which are irregular and unequal.

The substance of the test is of greater thickness than is usual in this genus; it is most nearly allied to *U. varicosum*, p. 73, tab. 8, figs. 7—8; but it is much more oblique and of greater length, the dimensions being, height, 14 lines; length, 17 lines; there is some amount of variation in the obliquity of the valves and we have specimens which exhibit greater obliquity than the example from Yorkshire.

*Geological position and localities.*—The grey limestone of the Great Oolite at Scarborough. In Gloucestershire it has occurred only in the Inferior Oolite in the bed called Trigonía Grit.

TRIGONIA DECORATA, *Lyc.* Tab. XV, fig. 1.

TRIGONIA DECORATA, *Lycett.* Ann. and Mag. Nat. Hist., 1853, vol. xii, pl. 11, f. 1.

*Testá ovato trigona, subcompressa, umbonibus obtusis, non recurvatis, arcá cardinali latá planá tripartitá; cariná interná tuberculis in varicis elongatis instructis, cariná mediá et marginali tuberculis minimis crebris ornatá; lateribus tuberculis per series arcuatis concentricè dispositis.*

Shell ovately trigonal, somewhat depressed; umbones obtuse, not recurved; anterior

and inferior borders rounded, posterior border lengthened and nearly straight; area wide, flattened, finely striated transversely, and divided into three portions by as many faintly traced carinæ, or rather as many lines of minute closely-arranged equal and regular tubercles, those of the inner carina, being elongated into as many varices or plications; there is, likewise, a median divisional groove, which is immediately adjacent to and parallel with the tubercles of the median carina. The clavellated portion of the shell has a numerous series of rows of concentric closely-arranged but not very prominent tubercles, the larger tubercles being towards the middle of the curvature; they are distinct, usually rounded, closely-arranged (15 or more being contained in a row), the number of rows in adult shells being about 20, the whole of which are distinctly tuberculated; the lines of growth upon the sides of the shell are fine and distinct. The dimensions are equal to the largest examples of the clavellated *Trigoniæ*. The species which approximate most nearly to our shell are *T. perlata*, Ag. *T. Bronnii*, Ag. *T. muricata*, Goldf. and *T. clavellata*, Sow., it having usually been mistaken for the latter shell.

*T. perlata* has the umbones more recurved; the tubercles upon the carinæ are much larger, and those of the median carina have in addition a series of transverse varices which are absent in *T. decorata*. *T. Bronnii* has the apex more elevated, it is destitute of the inner varices upon the area; the sides of the shell have a less numerous series of rows of tubercles, the tubercles being larger.

*T. muricata* has the area much smaller and more narrow; the lanceolate post ligamental space is smooth; the costæ upon the sides of the shell are distinctly elevated, the tubercles being more prominent and more distantly arranged in the rows.

*T. clavellata* has the figure more elongated and rostrated posteriorly; the umbones are much more recurved; the superior border of the area is distinctly concave; the lanceolate space is of great size, and the inner carina is destitute of varices; the sides of the valves have the rows of tubercles fewer, the tubercles more elevated and more distantly arranged in the rows; the general convexity of the valves being greater than in *T. decorata*.

The specimen forwarded to us from Yorkshire, is rather more elongated, and the costæ are somewhat more prominent than obtains in specimens from Gloucestershire; but there appears to be no essential difference between them.

*Geological position and localities.*—The Great Oolite of Scarborough; it is abundant likewise in the bed called Trigonia Grit of the Inferior Oolite in the Cotteswolds.

ASTARTE MINIMA, *Phil.* Tab. XIV, fig. 15.

ASTARTE MINIMA, *Phil.* Geol. York., 1, t. 9, f. 23.

— — *Williamson.* Geol. Trans., 2d ser., vol. v, pt. 1, p. 240.

*Testá parvâ ovato-acutâ convexâ; umbonibus prominulis obliquis; superficie apice lævigato; dorso striis concentricis magnis irregularibus.*

Shell small, ovately acute, convex; umbones prominent, pointed, oblique; margins of

the valves rounded; the surface smooth near to the apex, the remaining portion with large concentric irregular striations.

*Locality*.—This small species is not uncommon upon the slabs of Brandsby slate, and near Scarborough; it has not been identified in Gloucestershire. Mr. Williamson records it both in the Great and Inferior Oolite of Yorkshire.

ASTARTE ELEGANS, *Sow.* Tab. XIV, fig. 14, *vide antea*, p. 86.

CYPRINA ? DOLABRA, *Phil.*, sp. Tab. XIII, fig. 19.

CYTHEREA DOLABRA, *Phil.* Geol. York., 1, t. 9, f. 12.

*Testá parvá ovato-orbiculari, plano-convexa lævigata; umbonibus subacutis medianis elevatis; marginibus rotundis; lunulá magná excavatá.*

Shell small, ovately orbicular, rather flattened, smooth; umbones mesial, rather acute, and elevated; margins of the valves rounded; lunule large and excavated.

The depressed figure, elevated acute mesial umbones, and large lunule, separate it from other small contemporaneous species of the Cyprinæ.

Height, 4 lines; length, 5 lines; diameter through both the valves, a line and a half.

*Locality*.—Scarborough, in the Great Oolite.

ISOCARDIA CORDATA, *Buck.* Tab. XV, fig. 5.

ISOCARDIA CORDATA, *Buckman.* Geol. of Chelt., p. 98, t. 7, f. 1.

*Testá ovato orbiculari convexá, umbonibus magnis obliquis antemedianis antrorsum curvatis et separatis; areá ligamenti magná, sulco elongato, marginibus rotundis et integris; superficie lævi, striis concentricis tenuibus et irregularibus instructis.*

Shell ovately orbicular or cordiform; very convex near to the umbones, but rather compressed at the margins, which are regularly rounded and entire; umbones large, curved forwards, and separated by a large and lengthened ligamental area, upon each side of which is a groove which extends nearly to the posterior extremity, and is bounded above by an angle which may be traced to the extremities of the umbones; the surface is smooth, with fine irregular concentric striations; test very delicate.

Dimensions of the Yorkshire specimen; height, 18 lines; length, 21 lines; diameter through the valves, 15 lines.

*Localities*.—Scarborough, in the Great Oolite; larger examples, some of which have the test preserved, occur in the Inferior Oolite of the Cotteswolds, but it is unknown in the Great Oolite of Gloucestershire.

QUENSTEDTIA LÆVIGATA. Tab. XIV, fig. 13.

PSAMMOBIA LÆVIGATA, *Phil.* Geol. York., 1, t. 4, f. 5.

*Testá ovato-elongatá, compressá, lævigatá; umbonibus depressis, medianis; anticæ*

*rotundo, postice subtruncato, angulo obliquo obtuso instructo; margine cardinali subhorizontali, inferiore parallelo; lateribus striis irregularibus tenuibus.*

Shell ovately elongated, compressed and smooth; umbones depressed, mesial; anterior border rounded, posterior border somewhat truncated; an oblique obtuse angle descends from the umbo posteriorly; hinge border horizontal, lower border parallel, the surface with fine irregular longitudinal striations.

Compared with *Quenstedtia oblita*, this species is more elongated, the umbones more nearly mesial, and the longitudinal plications are much more delicate, producing a general smoothness of the surface. Length, 2 inches; height, 1 inch.

*Geological position and localities.*—Specimens have been forwarded to us from the Grey Limestone bed of the Scarborough Great Oolite; it also occurs in the Inferior Oolite of Blue Wick upon the same coast, and in the upper division of the Inferior Oolite of the Cotteswolds; we have also obtained a specimen in the Great Oolite of Minchinhampton, but it appears to be rare at each of these localities.

MYACITES BEANII. Tab. XV, fig. 11a, b.

*Testá orato-oblongá subcompressá, umbonibus depressis; antemedianis, arcá ligamenti angustá, parvá; margine postico rotundo; hianté basi et margine anteriore curvato; superficie sulco lato, superficiali instructo; plicis longitudinalibus magnis irregularibus.*

Shell ovately oblong, rather short and compressed; umbones antero-mesial, depressed; ligamental area small and narrow, the margin posterior to it nearly horizontal; the extremities of the valves rounded, the anterior extremity being almost closed, the posterior extremity with a lengthened and moderately large aperture; a superficial and vertical wide depression passes downwards from the umbones crossing the longitudinal plications, which are large and irregular.

This species is not without a considerable resemblance to *Homomya compressa*, Ag., but as the latter shell has the anterior side less produced, with a distinct aperture, together with umbones more elevated, we prefer to consider them distinct species; the short form, depressed small umbones, and fully developed nearly entire anterior border, will also serve to distinguish it from other of the British Myadæ. Length,  $2\frac{1}{4}$  inches; height,  $1\frac{1}{4}$  inch; diameter through the valves, 1 inch.

*Locality.*—Scarborough.

MYACITES SECURIFORMIS, *Phil.*, sp. Tab. XIII, fig. 15.

AMPHIDESMA SECURIFORME, *Phil.* Geol. York., 1, t. 7, f. 10.

PLEUROMYA SECURIFORME, *Ag.* Etud. Crit., p. 232.

*Testá elongatá, securiformi, compressiusculá, umbonibus submedianis parvis, margine antico et postico oblique-declivi, basi elliptico curvato; valvis in medio subdepresso, plicis longitudinalibus magnis distantibus, lunulá nullá.*

Shell elongated, subtrigonal or hatchet-shaped, umbones antero-mesial and small, anterior and posterior borders sloping obliquely downwards, the anterior slopes have the greater angle, lower margin curved elliptically; the extremities of the valves rounded, and no distinct aperture; the sides of each of the valves with a large superficial perpendicular mesial depression caused by a few large and distant longitudinal plications. The general figure is more compressed, the umbones more nearly mesial, and the extremities of the valves are more completely closed than is usual in this genus, there is also more or less degree of inequality in the valves. Numerous as are the forms of this genus, we have seen none which are likely to be confounded with the present species; some of the shorter specimens of *Pleuromya elongata*, Ag., resemble it in outline only, but the posterior aperture and greater convexity will at once distinguish the species of Agassiz.

Height, 13 lines; length, 22 lines; diameter through both the valves, 8 lines.

*Localities.* *Myacites securiformis* occurs abundantly in the Cornbrash both of Yorkshire and Wiltshire.

Mr. Bean has kindly forwarded us a fine specimen from the Great Oolite of Scarborough, which we have figured.

MYACITES DECURTATUS, *Phil.* Sp. Tab. XV, fig. 10a, b.

*Syn.* AMPHIDESMA DECURTATUM, *Phil.* Geol. York., 1, t. 7, f. 11.

PLEUROMYA DECURTATA, *Ag.* Etud. Crit. Myes., p. 232.

LUTRARIA DECURTATA, *Goldf.* Petref., t. 153, fig. 3.

*Testá ovato-elongatá, umbonibus anticis elevatis, latere antico brevi, abruptè truncato, postico elongato, attenuato et hiantè; margine superiori obliquè declivi, basi curvato, lateribus plicis longitudinalibus irregularibus.*

Shell ovately elongated, umbones anterior, elevated; anterior side short, truncated, with a superficial vertical depression; posterior side elongated and attenuated, superior margin sloping obliquely downwards, the extremity with an aperture of moderate size and elongated, lower border curved elliptically; the sides of the valves with longitudinal irregular plications.

Compared with its congeners, the elevated umbones, short anterior side, and lengthened attenuated posterior side, will usually serve to distinguish it; the middle portion of the shell is moderately tumid, the two extremities being somewhat compressed; the posterior aperture extends both upon the superior and inferior borders; we have not seen the outer granulated layer of the test.

Height, 11 lines; length, 20 lines; diameter through both the valves, 9 lines.

*Locality.* *Myacites decurtatus* occurs in the Cornbrash both of Yorkshire and of Wiltshire; we have also been favoured by Mr. Bean, with a specimen from the Great Oolite near Scarborough.

MYACITES SCARBURGENSIS, *Phil.* Sp. Tab. XV, fig. 13.

*Syn.* LUTRARIA GIBBOSA, *Phil.* Geol. York., 1, t. 9, f. 6.

*Testá ovato-elongatá, compressiusculá, umbonibus antemedianis parvis, margine antico rotundo, producto, postico elongato, hiante; basi elliptico curvato, margine superiori subhorizontali, concavo; lateribus compressis, plicis irregularibus magnis longitudinalibus.*

Shell ovately elongated, compressed; umbones anterior to the middle of the valves, small and not much elevated; anterior side produced, its margin rounded; posterior side lengthened, and gaping with a moderately large aperture; base curved elliptically; the sides of the valves are compressed, and have large irregular longitudinal plications; the ligamental area is large and excavated, the posterior aperture extending upon the horizontal superior border nearly to the ligament.

A species somewhat resembling *Myopsis Jurassi*, Ag., but less tumid, or more compressed in its middle part.

Height, 17 lines; length, 31 lines; diameter through both the valves, 12 lines. The specimen figured is the original one drawn by Professor Phillips.

*Locality.* Scarborough. Mr. Bean's Collection.

MYACITES GIBBOSUS, *Sow.* Sp. Tab. XII, fig. 14, (junior.)

*Syn.* PANOEPA GIBBOSA, *Sow.* Min. Con., t. 211.

— AGASSIZII, *Valenc.* Arch. du Mus., 1, p. 31.

MYACITES GIBBOSUS. *Morris.* Catal. 2d edit., 1854, p. 213.

MYA GIBBOSA, *D'Archiac.* Mem. Soc. Geol. Fr., vol. 5, pl. 26, f. 1, 1845.

— MODICA, *Bean.* MSS. (junior.)

*Testá ovato-oblongá, ventricosá, umbonibus rotundis, magnis, elevatis ante medianis, latere antico brevi, margine rotundo, latere postico compresso, margine aperturá angustá, basi elliptico curvato; margine superiori concavo; areá ligamenti magná, ellipticá; lateribus striis irregularibus tenuissimis.*

Shell ovately oblong, ventricose; umbones rounded, large, elevated, and placed anterior to the middle of the valves; anterior side short, convex; its margin rounded, gaping with a small aperture; posterior side compressed, its extremity with a narrow lengthened aperture; base elliptically curved; superior margin rather concave; ligamental area large, elliptical, depressed; sides of the valves with fine irregular longitudinal striations.

The small specimen forwarded us from the Great Oolite of Scarborough, is the young

condition of the large and well-known *Panopæa gibbosa*, Sow., a species in which the test has not been observed, and which in the Cotteswolds and West of England, is procured in the upper portion of the Inferior Oolite; our small example is more than usually elongated, but the species differs very much in this particular, and we possess examples from the Inferior Oolite in which the posterior side is fully as much elongated. The large elevated umbones and tumid anterior side of the shell, serves to distinguish it from another Inferior Oolite species hitherto undescribed, and for which it has not unfrequently been mistaken; the older or fully developed specimens of *Myacites gibbosus* are invariably shorter and more ventricose. The shell figured by d'Archiac represents a specimen of medium size; the *Homomya gibbosa*, Ag., 'Etud. Crit. Myes,' pl. xviii, is our *Myacites Vezelayi*, a shell which never occurs in the Inferior Oolite.

Dimensions of the small Yorkshire example. Height, 13 lines; length, 25 lines; diameter through both the valves, 11 lines.

*Locality.* Scarborough.

MYACITES ÆQUATUS, *Phil.* Sp. Tab. XII, fig. 15.

MYA ÆQUATA, *Phil.* Geol. York., 1, t. 11, f. 12, (junior.)

*Testá ovato-tumidá, umbonibus magnis, elevatis antemedianis, latere antico producto, postico attenuato; margine superiore concavo, declivi; basi elliptico curvato.*

Shell ovate, tumid; umbones large, elevated, slightly compressed, and placed anterior to the middle of the valves; anterior side produced, middle portion ventricose, posterior side rather compressed and attenuated; lower border curved elliptically; the sides of the valves have fine irregular striations. Our species possesses some general resemblance to *Pleuromya tenuistria*, Ag., but it is more lengthened, and the posterior side is more attenuated, the superior border having a greater declivity.

We believe that the small shell figured by Phillips under the name of *Mya æquata*, is the young condition of the larger specimen we have figured, in which the posterior side has with increase of growth become somewhat more elongated.

Height, 12 lines; length, 20 lines; diameter through both the valves, 10 lines.

*Locality.* Scarborough, in the Grey Limestone.

GRESSLYA PEREGRINA, *Phil.* Sp. Tab. XV, fig. 8a, b.

*Syn.* UNIO PEREGRINUS, *Phil.* Geol. York., 1, t. 7, f. 12.

GRESSLYA ERYCINA, *Ag.* Etud. Crit. Myes., p. 214, t. 14, f. 1—9.

GRESSLYA CONCENTRICA, *Ag.* Etud. Crit. Myes., p. 213, t. 14, f. 10—15.

— PEREGRINA, *Morris.* Cat. Brit. Foss., 2d ed., 1854, p. 203.

*Testá ovato-cordiformi, tenui, umbonibus antemedianis subdepressis, anticè productá et*

*tumidá, lunulá magná, excavatá; posticè compressá, margine cardinali curvato, obliquè declivi; plicis incrementi magnis, paucis, irregularibus. Superficie granulis densè, ornatis, granulis in lineis radiantibus minutis serialibus regularibus instinctis.*

Shell ovately cordiform, the test very thin, anterior side very convex and produced posterior side attenuated and compressed; umbones depressed, placed at about one third from the anterior margin, lunule large, excavated; hinge border curved and sloping obliquely downwards, its posterior extremity rounded. The sides of the valves have large irregular but distant plications.

The entire surface is very densely ornamented with minute granules disposed in closely-arranged fine radiating lines, the lines being distinctly raised and uniting the granules at their bases.

Agassiz has not noticed the *Unio peregrinus*, but his tab. XIV contains numerous and truthful exemplifications of its phases of aspect under the names of *Gresslya erycina* and *G. concentrica*.

The most prominent distinguishing feature of *Gresslya peregrina*, consists in the great development of the anterior side, and the compression of the posterior, so that when placed upon its side, the anterior border and lunule faces the spectator.

Some specimens of *Gresslya latirostris*, Ag., from the Inferior Oolite of the Cotteswolds, much resemble our species in their general outline, but the more considerable diameter through the valves upon the anterior side of *G. peregrina*, will always distinguish it, together with the more compressed and shortened figure of the posterior side.

From *Gresslya abducta* (*Unio abductus*, Phil.), it is readily distinguished by the more elevated umbones and shorter anterior side of the latter species.

*Geological position and localities.* *Gresslya peregrina* occurs both in the Cornbrash, and in the Grey Limestone of the Great Oolite, near Scarborough.

#### GONIOMYA V-SCRIPTA, Sow. Sp. Tab. XIII, fig. 16.

*Syn.* MYA V-SCRIPTA, Sow. Min. Con., t. 224, f. 2—5.

GONIOMYA V-SCRIPTA, Ag. Etud. Crit. Myes., t. 16, f. 17—19.

GONIOMYA V-SCRIPTA, Morris. Catal. 2d edit., 1854, p. 203.

*Testá ovato-subtrigóná, umbonibus submedianis, margine antico rotundo, postico sub truncato, costis angulis acutis verticalibus, extremitate postico lævi.*

Shell ovate, somewhat subtrigonal; umbones nearly mesial; anterior border rounded; posterior border somewhat truncated, lower margin nearly straight; from the umbones the anterior and posterior margins slope obliquely downwards, the posterior side, which is slightly the longer, having its slope at a smaller angle than the other; costæ numerous, their angle acute, and directly perpendicularly downwards, or a little backwards; the

posterior extremity is destitute of costæ; the costæ nearly of equal size upon both the sides of the shell.

The *Lysianassa v-scripta* of Goldfuss, Pet., t. cliv, fig. 6, is the *Mya literata* of Sowerby, Phillips, and Agassiz.

*Geological position and localities.* Great Oolite, Scarborough; Kelloway Rock, Wilts; Cornbrash, Bedford; Inferior Oolite, Brora; Claydon, and the Cotteswolds.

PHOLADOMYA OVALIS, Sow. Tab. XV, fig. 14.

PHOLADOMYA OVALIS, Sow. Min. Con., t. 226.

? — PELAGICA, Ag. Etud. Crit. Myes., p. 105, t. 2, f. 5—7.

— NANA, Phil. Geol. York., 1, t. 9, f. 7, (junior.)

*Testâ elongato-ovatâ, anticè ventricosâ brevi, posticè elongato, angusto, vix, hiante; umbonibus magnis, elevatis; lateribus plicis longitudinalibus irregularibus et costis (circa 9) distantibus angustis, subperpendicularibus.*

Shell ovately elongated; anterior side ventricose, its margin closed; posterior side attenuated and elongated, its aperture small; umbones large, elevated; superior border nearly horizontal, and sinuated, base curved elliptically; the sides of the valves with irregular longitudinal plications, crossed by costæ, which are narrow, distant (about nine in number), nearly of equal size, and are nearly perpendicular; the anterior and posterior sides are without costæ.

Of the costæ five or six are prominent, and are distinct to the lower border, the others are less elevated, and are gradually lost upon the surface. *P. pelagica*, Ag., and *P. decemcostata*, Roemer, have the costæ more oblique, but we think that the species is subject to some variability in this respect, and that they cannot be separated; *Pholadomya nana*, Phillips, we also regard as a young example of the same species; we have arrived at this conclusion from a comparison of the original specimen figured in the 'Geology of Yorkshire,' and placed at our disposal by Mr. Bean.

Height, 14 lines; length, 25 lines; diameter through both the valves, 12 lines.

*Localities.* The specimen forwarded to us is from the Grey Limestone of Scarborough; it also occurs in the Cornbrash of the same locality.

PHOLAS PULCHRALIS, Bean. MSS. Tab. XIII, fig. 17.

*Testâ subcylindricâ, medio constricto, lateribus convexis hiantibus, costellis paucis inæqualibus radiantibus, umbonibus medianis depressis, et sulco mediano perpendiculariter instructo, lateribus semel plicis longitudinalibus subundulatis et crebris.*

Shell subcylindrical, short, compressed in the middle portion, and convex towards the two extremities, each of which gapes with a considerable aperture; umbones mesial and

depressed; a narrow sulcation passes nearly perpendicularly from the umbo to the inferior border; the sides of the valves have numerous closely arranged and nearly regular but depressed plications; the plications towards the extremities are crossed by a few radiating and rather irregular costæ, which are most prominent upon the anterior side, but upon each side the costæ become indistinct which are nearest to the middle of the shell.

Lateral diameter, 13 lines; height, 9 lines.

*Geological position and locality.* The specimen kindly forwarded to us by Dr. Murray of Scarborough, is from the Grey Limestone of the Great Oolite.

*PHOLAS COSTELLATA.* Tab. XIII, fig. 18.

*Testâ parvâ, ovatâ, anticè convexâ, costellatâ, posticè attenuatâ sub-lævigatâ; umbonibus magnis ante medianis, compressis; valvis in medio sulco obliquo; costellis prominentibus subacutis irregularibus; laminis concentricis crebris depressis.*

Shell small, ovate; anterior side convex, with radiating, irregular, subacute costæ; posterior side nearly smooth; the middle of the valves is depressed, with a groove which passes obliquely downwards and backwards; the umbones are placed anterior to the middle of the valves, they are large and compressed; the extremities of the valves are nearly closed; the concentric lamellæ upon the sides of the shell are fine, and closely arranged, nearly disappearing upon the posterior half of the valves. The calcareous crypt, which contains the shell, is obtuse anteriorly.

Compared with *Pholas Oolitica* the costæ are more distinct and numerous upon the anterior half of the valves; the concentric lamellæ are more numerous, closely arranged, and much less conspicuous, so that they scarcely impress the radiating costæ; the mesial sulcus is more oblique, and the general figure of the shell is less cylindrical; the crypt is less ovate, or more nearly pyriform, the anterior extremity being more obtuse. The posterior extremity of the shell is somewhat embedded in the crypt, and is not sufficiently exposed to enable us to give the dimensions with accuracy; the costæ upon the anterior half are about 12 in number, and nearly straight; the anterior extremity does not exhibit any distinct apertures.

*Locality.* Scarborough.

*CEROMYA CONCENTRICA.* Tab. XV, fig. 3, *antea*, p. 108.

*GERVILLIA ACUTA.* Tab. XIV, fig. 1, 1*a*, *antea*, p. 20.

*Trigonia conjungens* is probably a variety of *T. angulata*.

NOTE.—We are indebted to the liberality of Mr. J. Leckenby and Mr. W. Bean, of Scarborough, for the loan of the specimens above described from the Oolite of Yorkshire.

## ADDENDA.

PHOLADOMYA OBLITA. Tab. XII, fig. 5.

Shell ovately ventricose, umbones large, elevated; anterior side tumid, posterior side produced, compressed, its extremity gaping with a narrow aperture; superior border concave, inferior border curved elliptically; sides of the shell with very numerous, fine radiating lines, which are effaced towards the lower borders, and are absent towards the two lateral extremities.

The shell which most nearly resembles the present species is the well known *Pholadomya fidicula*, Sow., from which it is distinguished by the shorter and more ventricose figure, by the much larger and more elevated umbones, by the considerable curvature of the lower border, and by the surface, which, in lieu of the acute elevated costæ of *P. fidicula*, has very much more numerous, fine, lines, which vanish towards the lower border. *Pholadomya oblita* has occurred rarely in sandstone at the base of the Great Oolite, and also in the Inferior Oolite of the Cotteswolds.

*Localities.* Minchinhampton Common, in the Great Oolite. Selsley and Frocester hills, in the Inferior Oolite.



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#### CORRIGENDA.

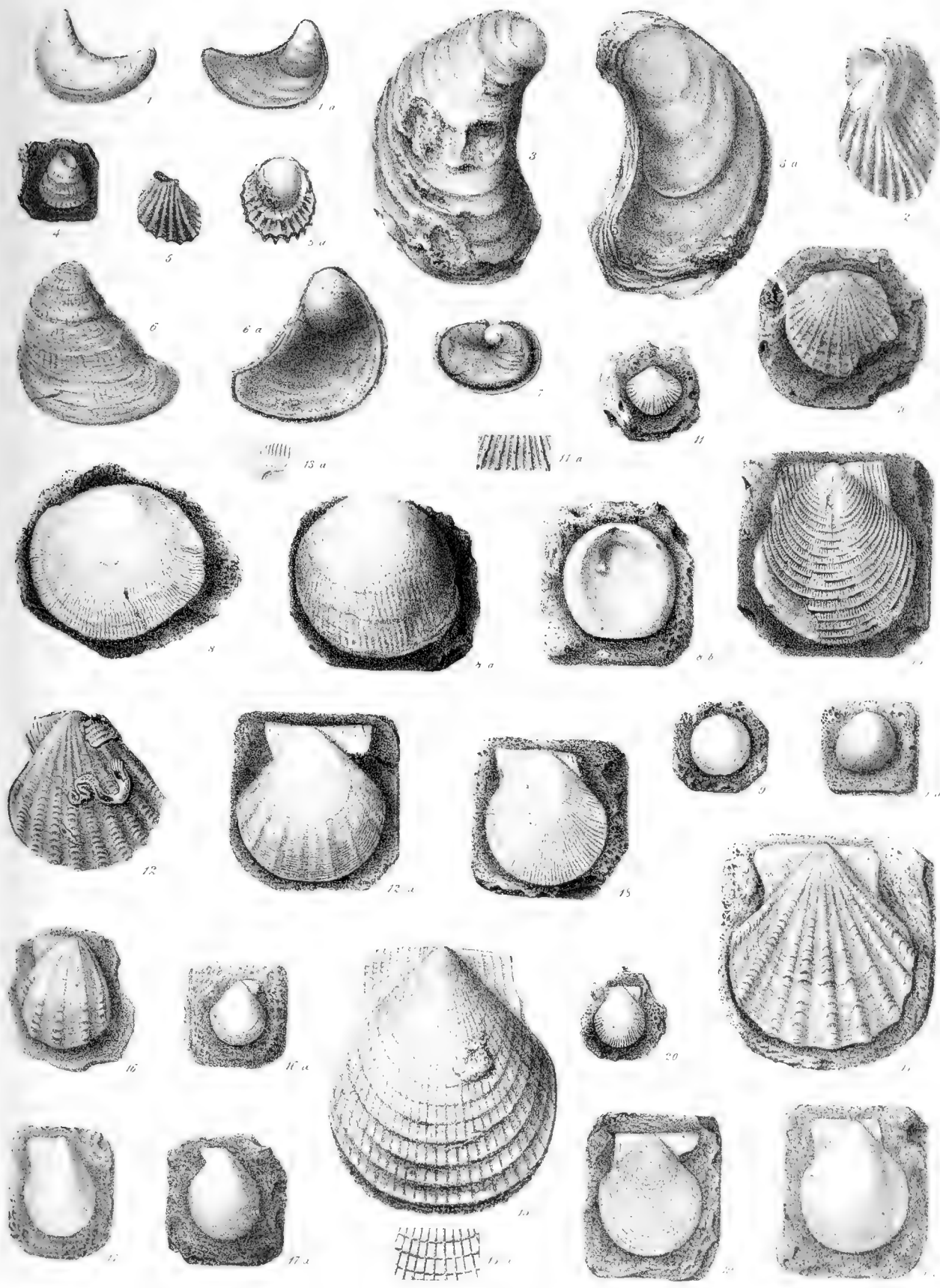
- Part I, p. 27, *for* "Purpuroidea Moreausia," *read* "P. Morrisii, Buv.;" *Purpura* Moreausia, is considered by M. Buvignier to be a distinct species.
- p. 48, *for* "Eulima pygmæa," *read* "Eulima vagans (junior)."
- p. 93, *for* "Patella nana," *read* "Patella cingulata (junior)."
- Part II, p. 24, *for* "Inoceramus Fittoni, Tab. iv," *read* "Tab. iii."
- p. 48, sixth line from the bottom, erase the four words within the parenthesis.
- p. 49, second line, erase the last three words. The raised ledge which supports the *anterior* muscular impression in *Macrodon* separates it from other sub-genera of *Arca*; in *Cucullæa* the ledge is *posterior*.
- p. 75. Both *Cypricardia Bathonica*, d'Orb. and *C. cordiformis*, Desh., occur in the Inferior Oolite of the Cotteswolds but in different beds, further observations have induced us to regard them as only varieties of the same species induced by peculiarities of the beds in which they occur.



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- 1, 1 *a.*     *Ostrea acuminata*, *page* 3.
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- 3, 3 *a.*     „     *Sowerbii*, *p.* 4.
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- 5, 5 *a.*     „     *costata*, *p.* 3.
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- 8, 8 *a.*     *Placunopsis Jurensis*, *p.* 6.
- 8 *b.*         Interior of Ditto, showing muscular impression.
- 9, 9 *a.*     *Placunopsis socialis*, *p.* 7.
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- 19, 19 *a.*    „     *clathratus*, *p.* 13.
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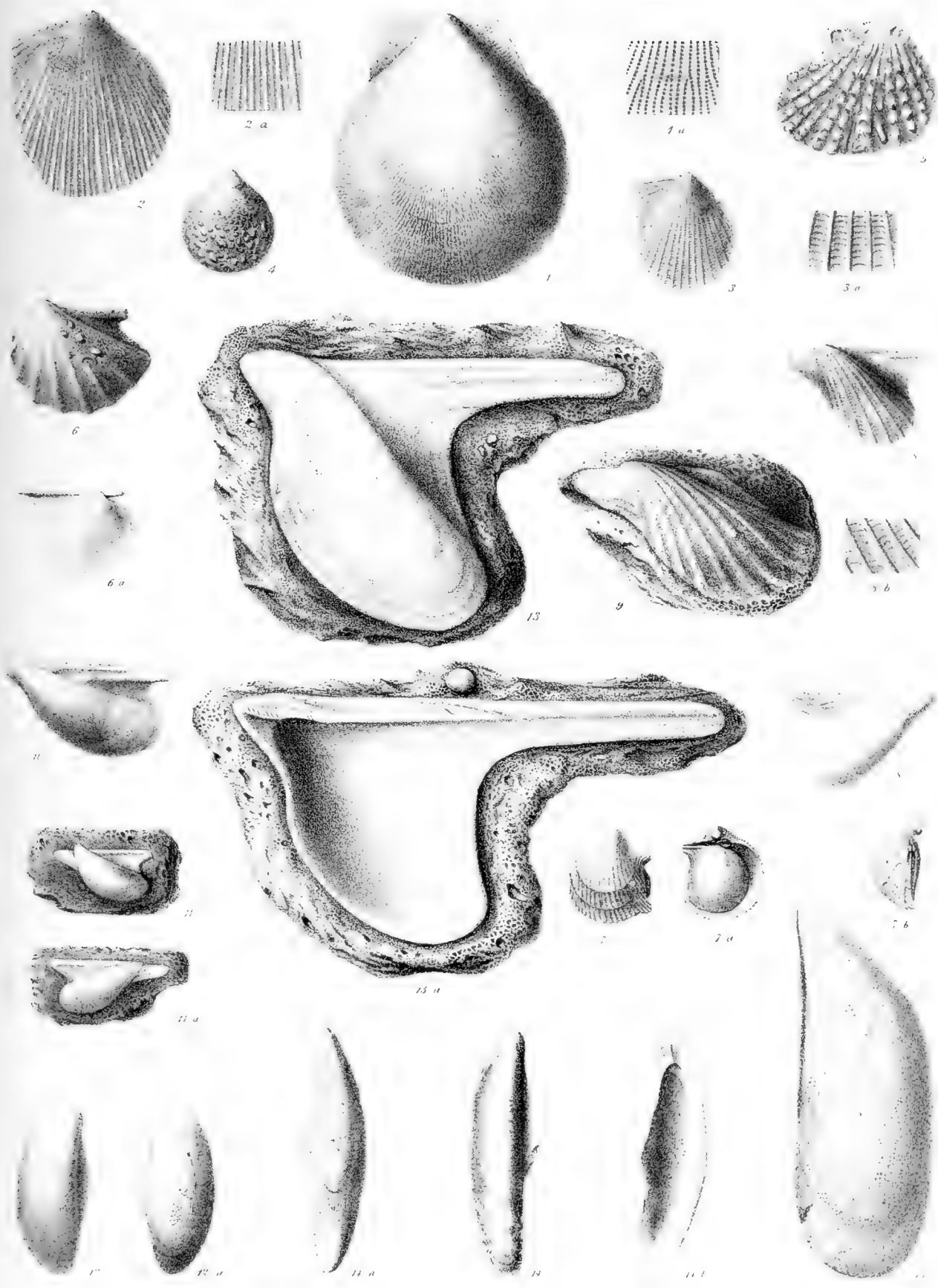




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| 4.                   | <i>Plicatula tuberculosa</i> , <i>p.</i> 15.  |
| 5.                   | „ <i>fistulosa</i> , <i>p.</i> 15.  |
| 6, 6 <i>a</i> .      | <i>Avicula costata</i> , <i>p.</i> 15.  |
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| 8.                   | <i>Pteroperna costatula</i> , young of, showing the costated surface, <i>p.</i> 18. |
| 9.                   | <i>Gervillia crassicosta</i> , <i>p.</i> 23.  |
| 10.                  | <i>Pteroperna emarginata</i> , <i>p.</i> 19.  |
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| 13.                  | <i>Pteroperna costatula</i> , <i>p.</i> 18.   |
| 13 <i>a</i> .        | Interior of ditto, showing muscular impression and hinge area, <i>p.</i> 18.        |
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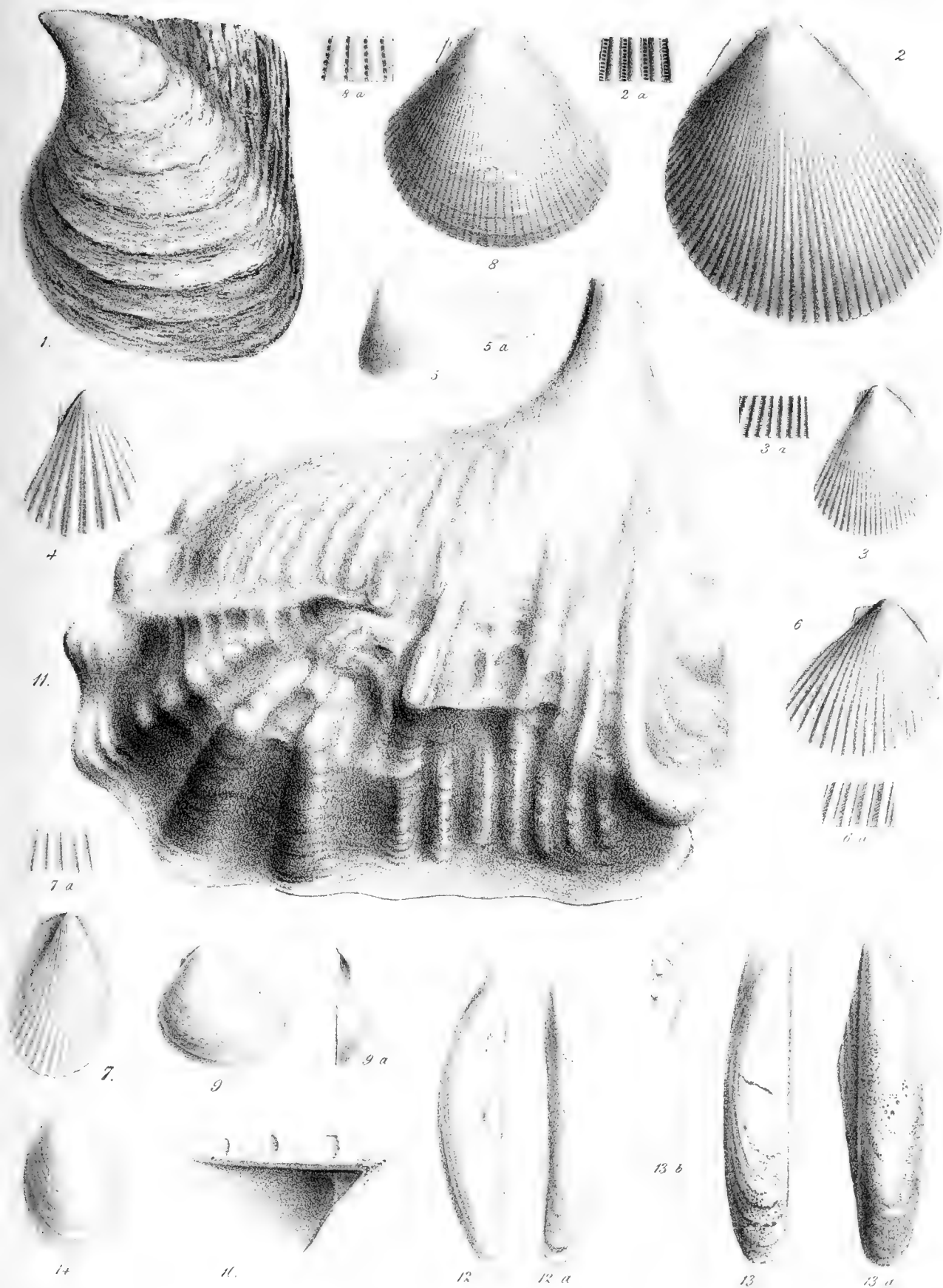






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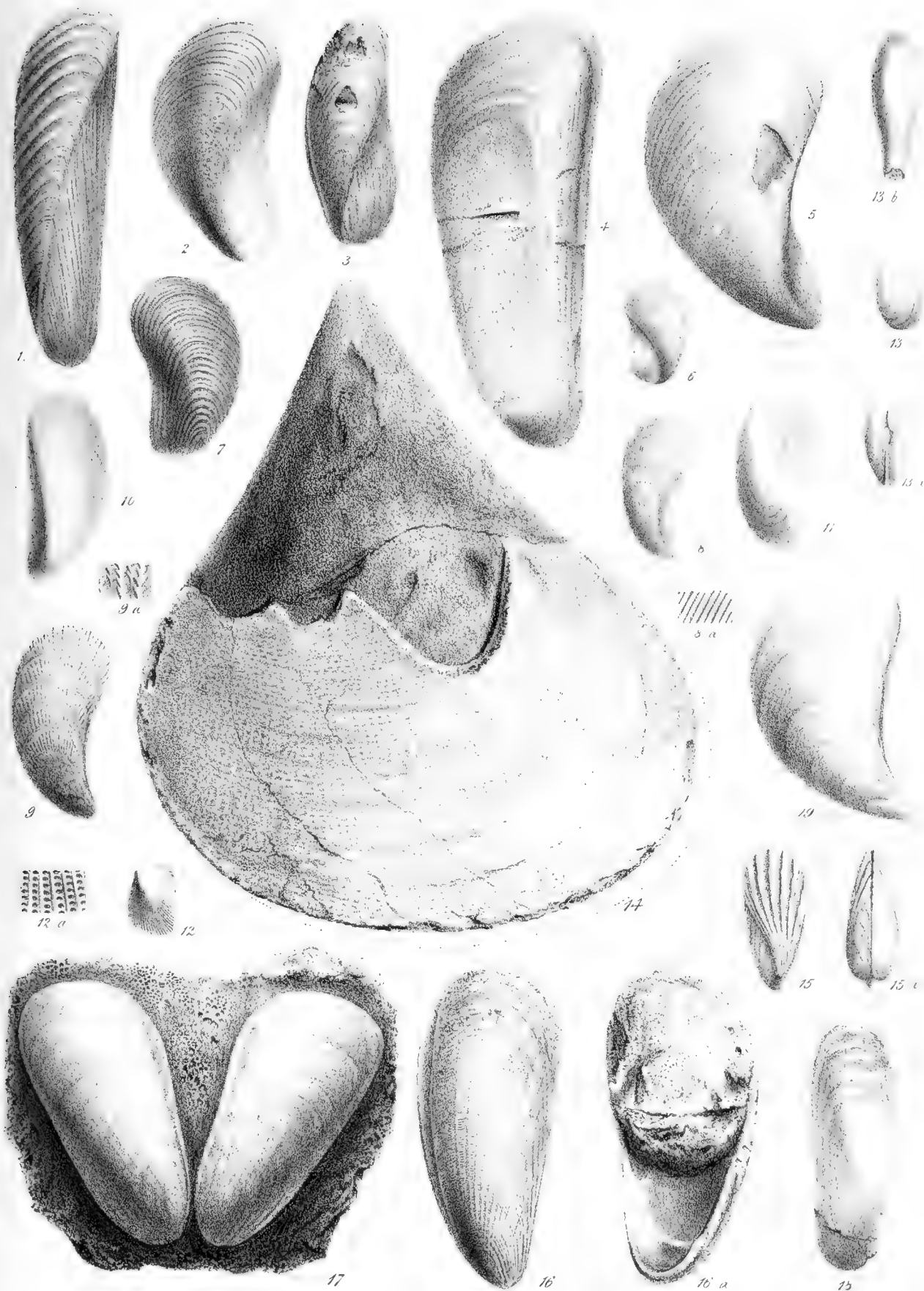






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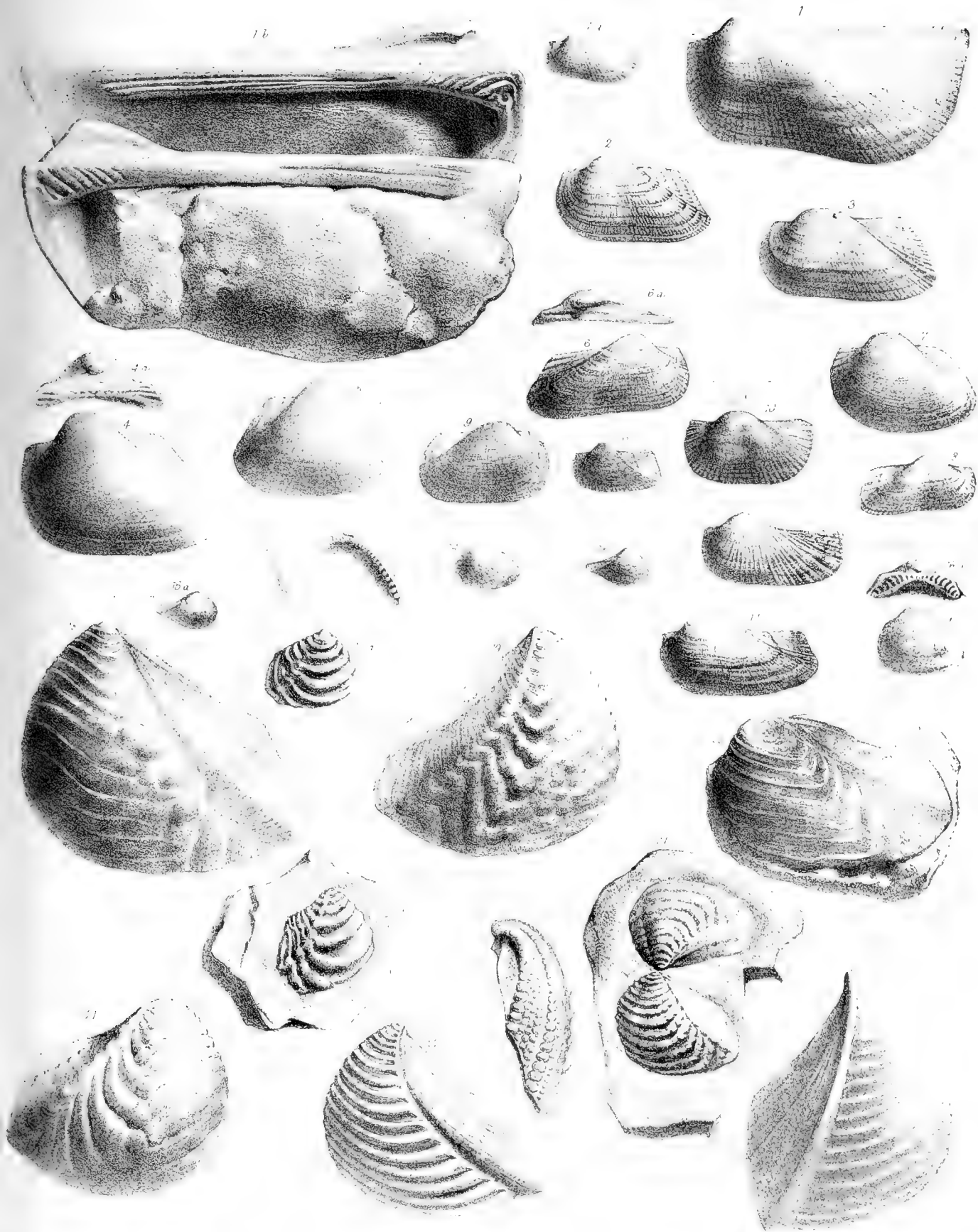




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- 1, 1 *b*. Macrodon (Arca) Hirsonensis, *p.* 49.
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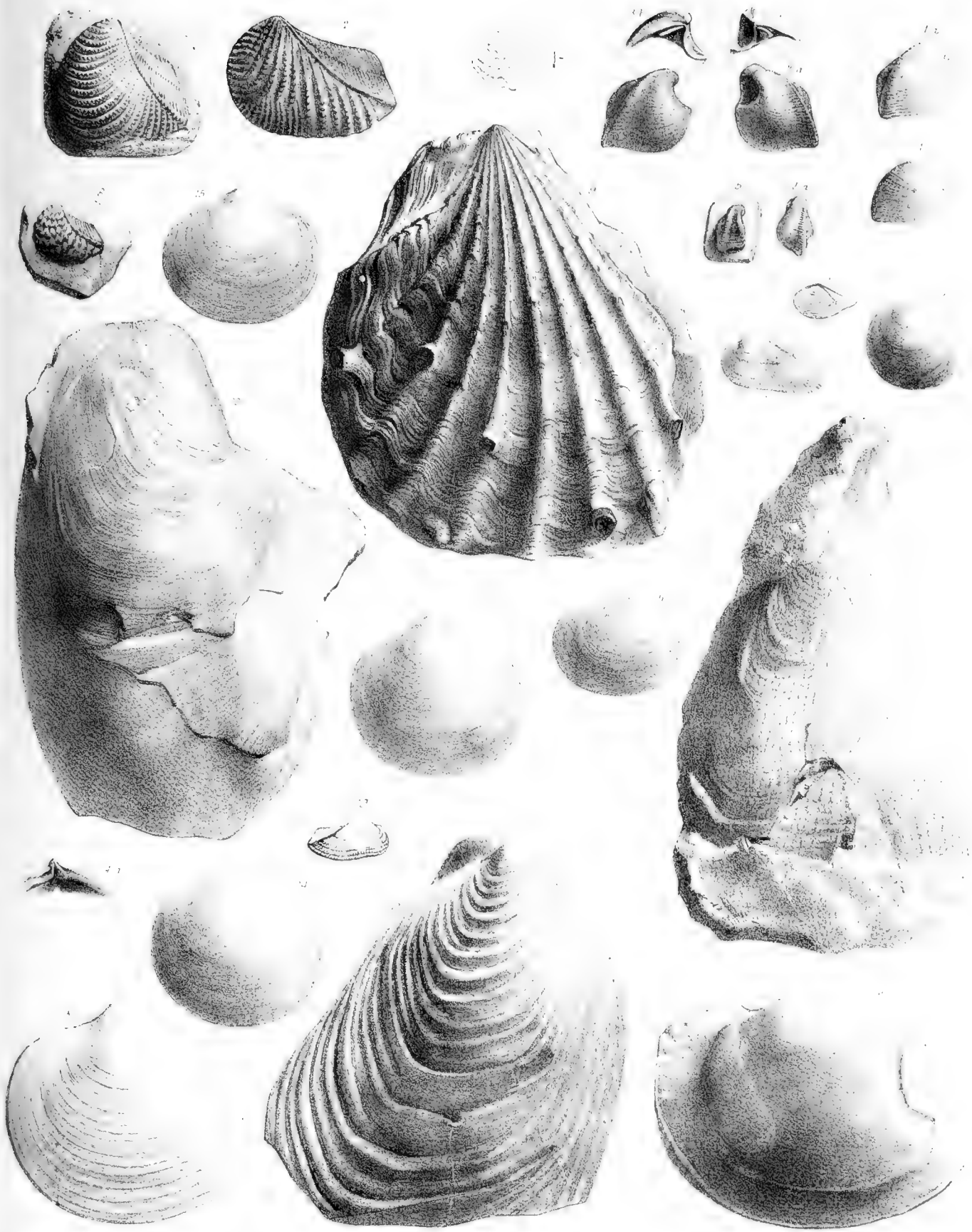






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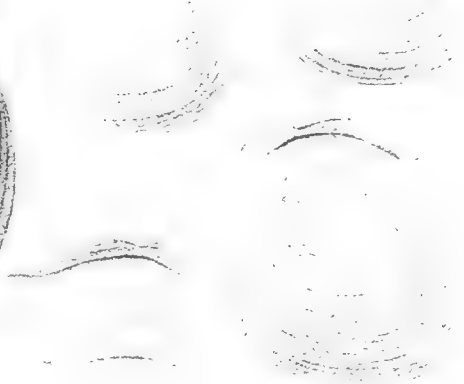
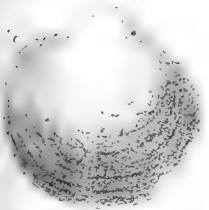




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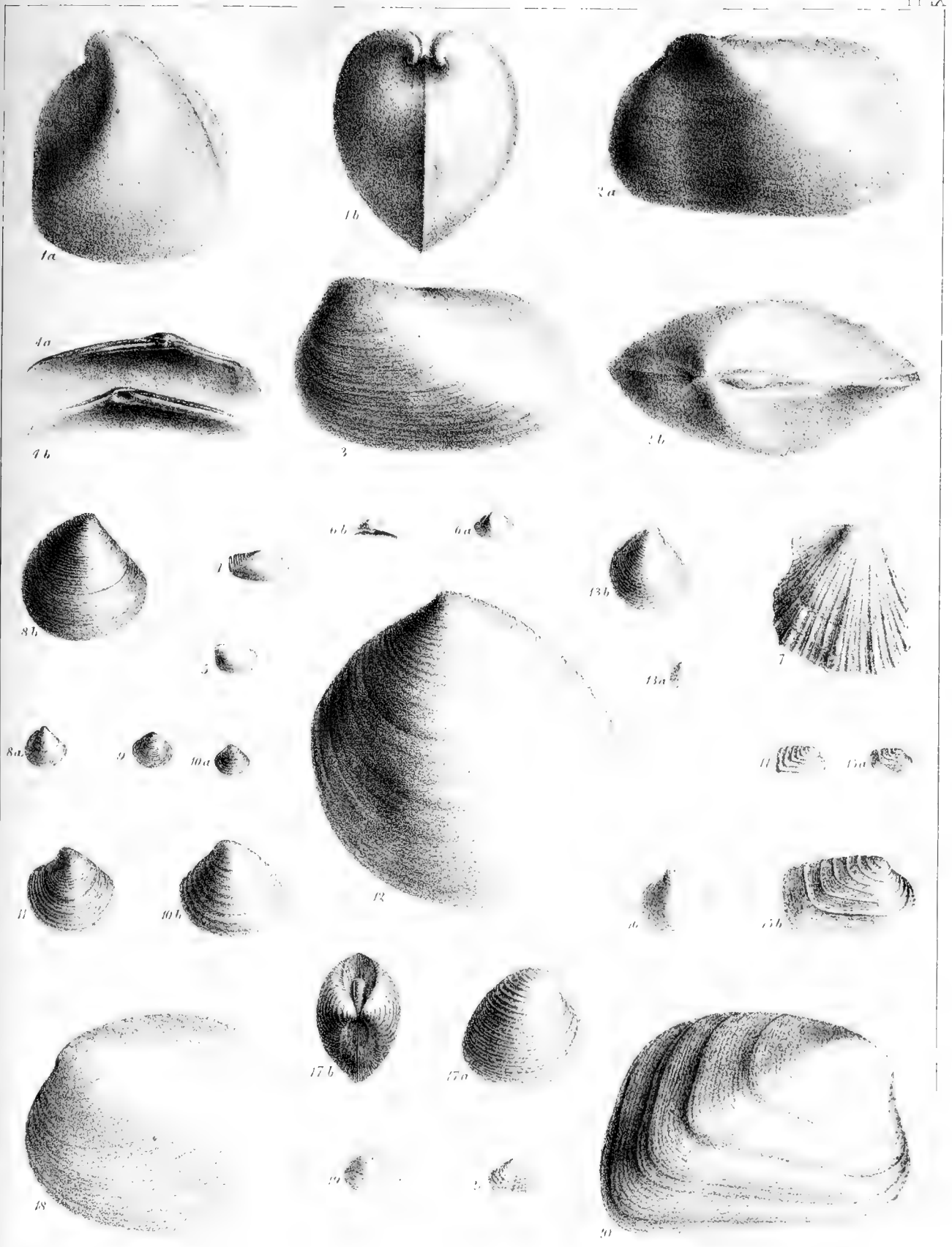






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2. ditto. p. 107.

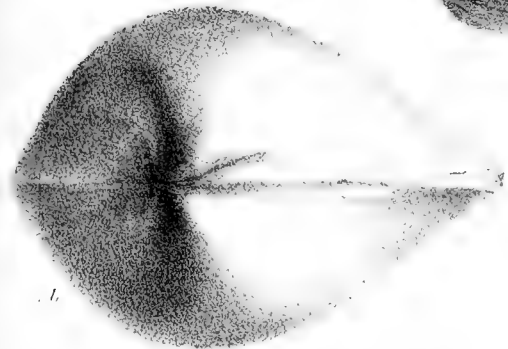
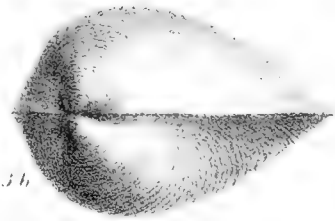
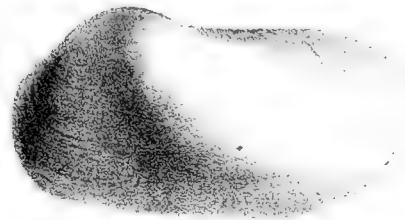
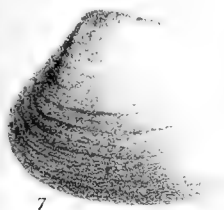
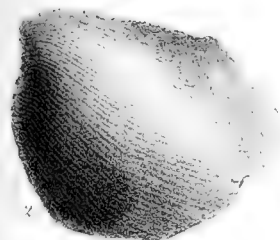
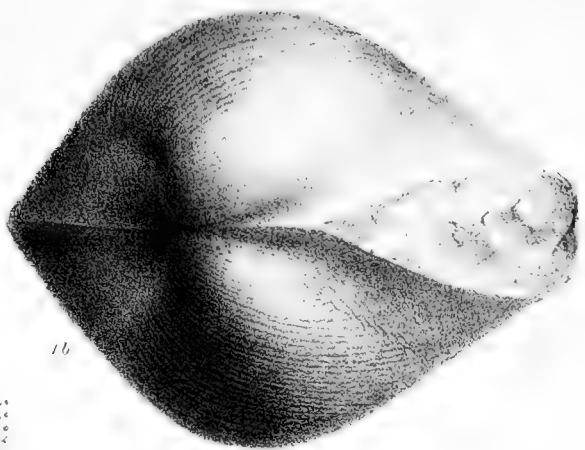
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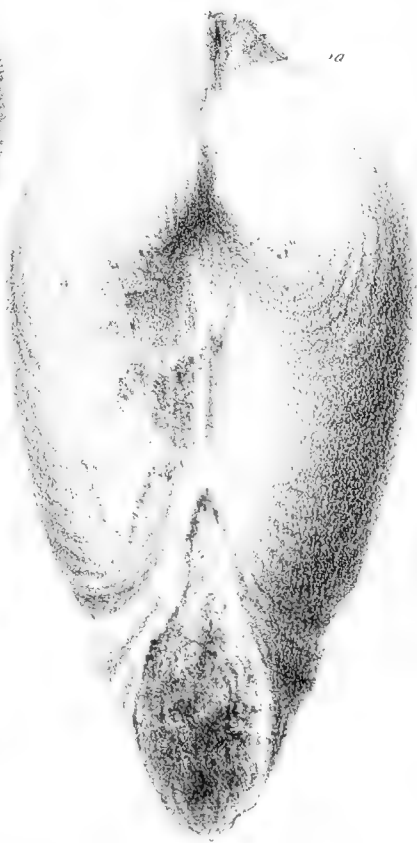
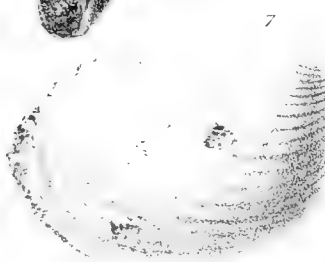
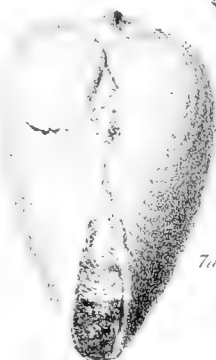
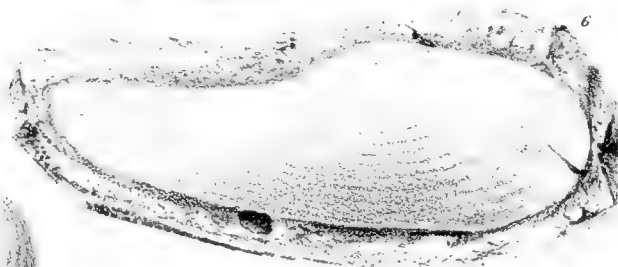
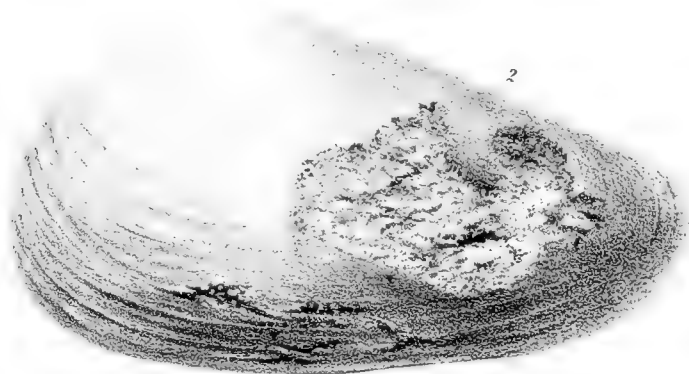




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- 6, 6*a*. *Anatina plicatella*, p. 118.
- 7, 7*a*. *Pholadomya socialis*, p. 122.



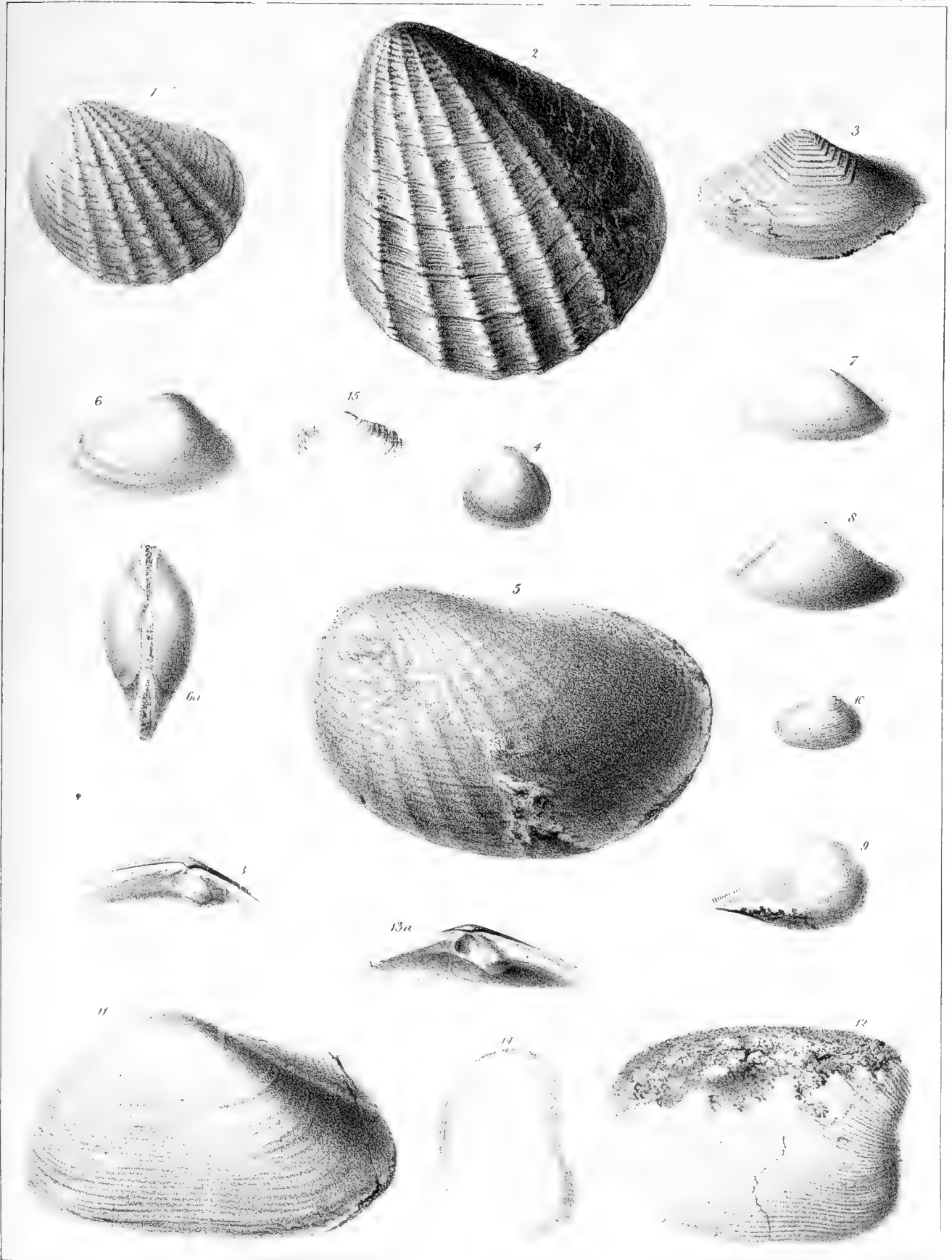




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12. *Ceromya similis*, p. 109.
14. *Myacites gibbosus*, p. 138.
15. *Myacites æquatus*, p. 139.

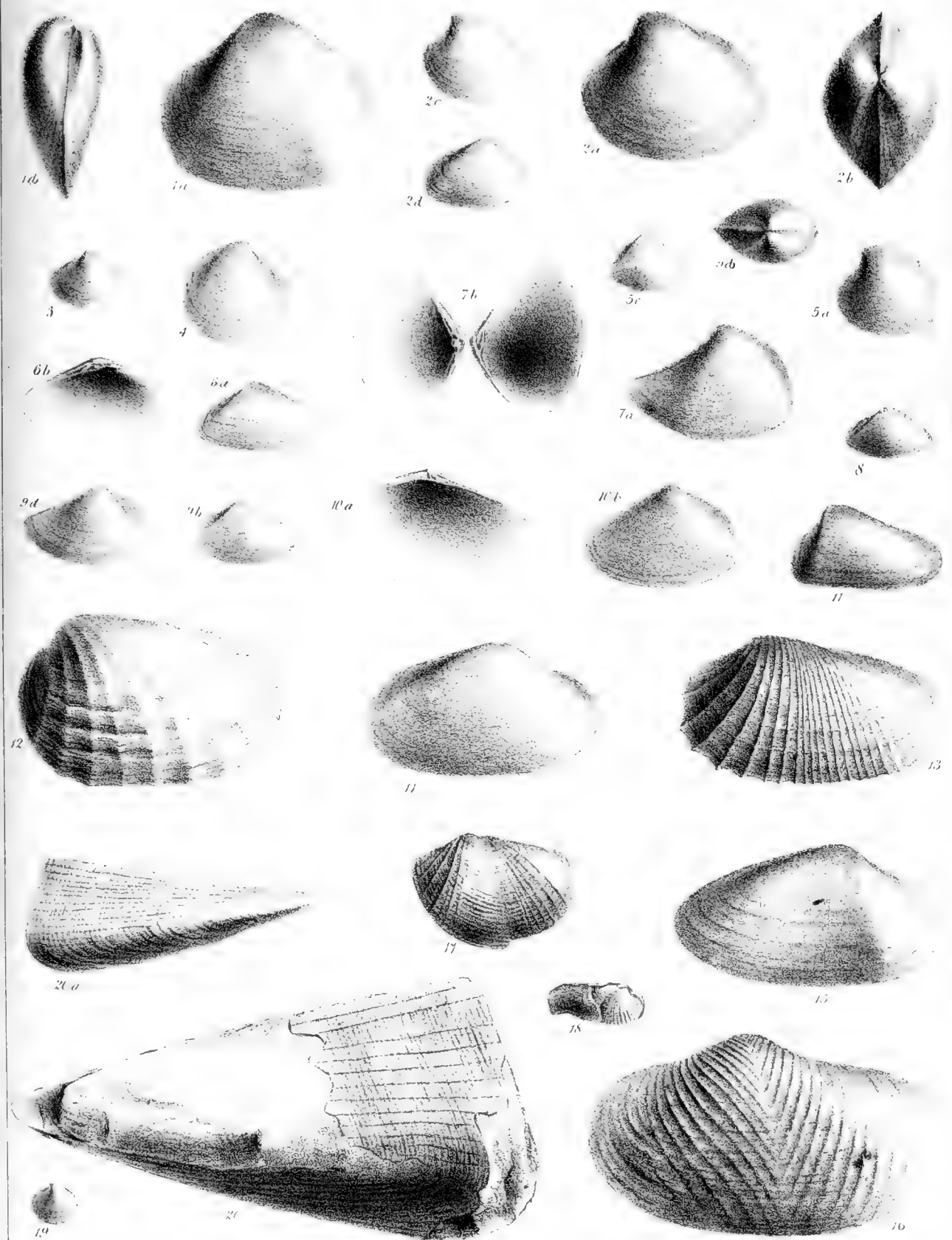






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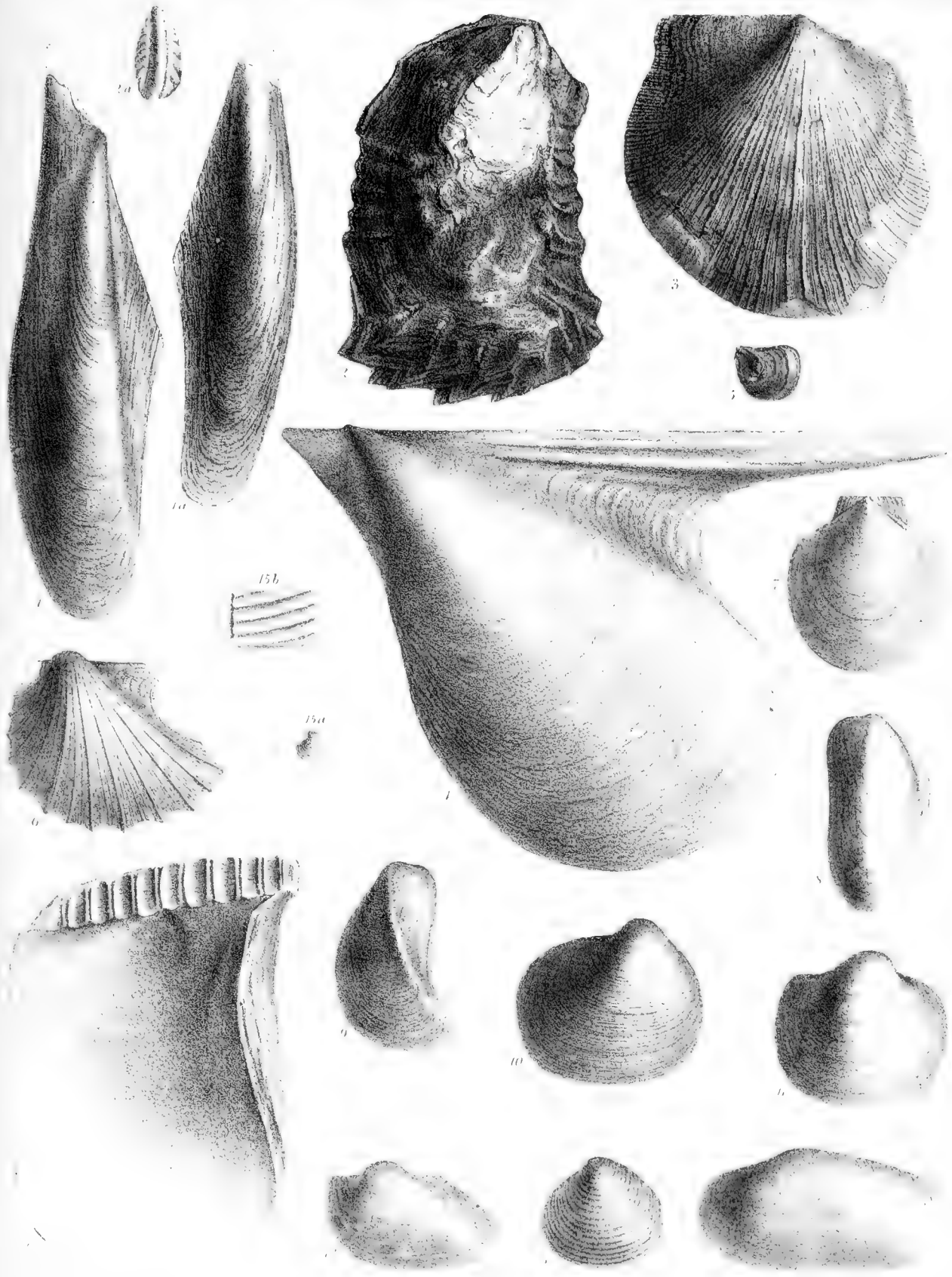




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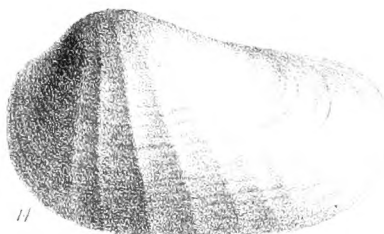
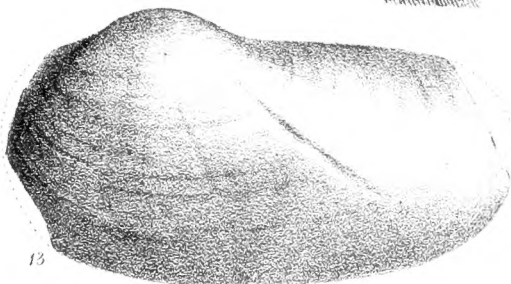
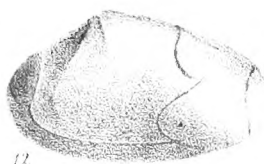
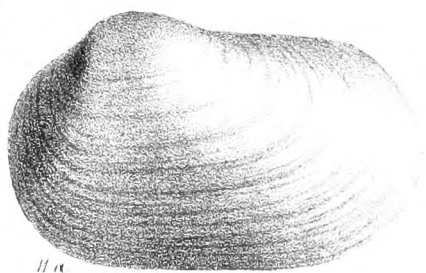
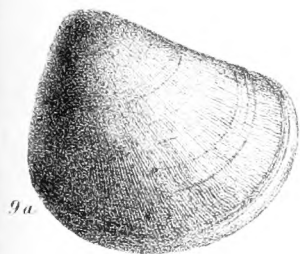
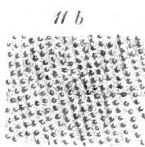
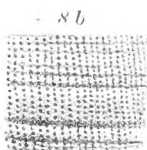
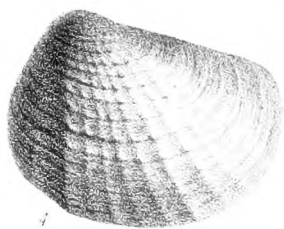
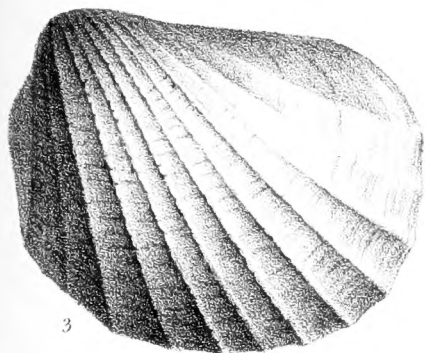
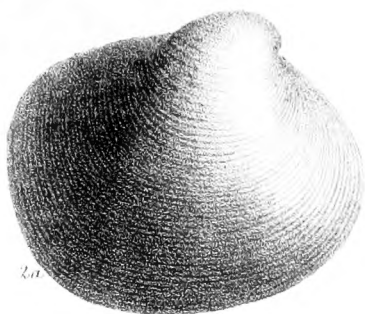
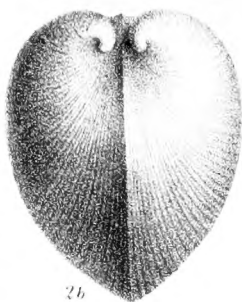
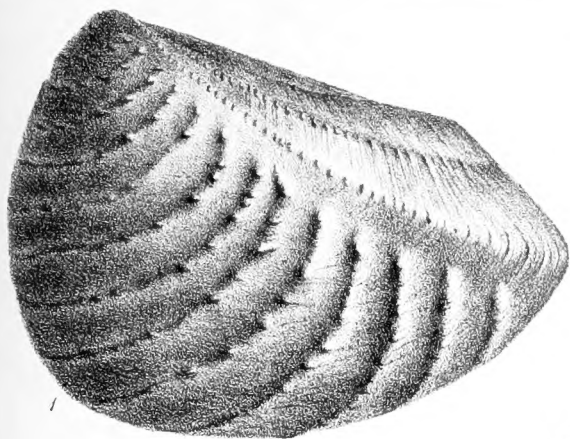




## TAB. XV.

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